




# *CAUSATION*

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A large, multi-pointed red starburst graphic with a jagged, irregular shape, centered on the page. It has a solid red fill and a white outline.

EBV- a  
cause of  
breast  
cancer.

# **Origins of Dark Energy**

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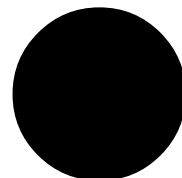
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## Dialectical tensor logic.

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### *Abstract*

**Classical logic** is more or less free of uncertainty and deals about the values either 0 or 1. Classical logic as such has a strong capacity to exploit structure and is in this sense at the end familiar with general relativity. Contrary to Classical Logic, **Probability theory** is known to be powerful enough to handle uncertainty and is in this sense at the end very familiar with quantum mechanics. The world of probability theory is always located between 0 and 1, probability is a number between 0 and 1. An impossible event is known to have a probability of exactly 0, a certain event has a probability of 1. In so far, it appears to be difficult to find a connection between classical logic and probability theory, it appears impossible to unify general relativity and quantum mechanics into one theory using the same language. The one appears to be the complementary of the other, the opposite of the other, the one seems to exclude the other out of itself and vice versa. Consequently, where logic governs, there is no probability and vice versa. Where probability governs, there is no logic. On the first sight, it appears to be impossible to unite both. Is there logic in probability, is there probability in logic, is there something like a probabilistic logic (Nilsson, 1986)? Is there relativity in quantum mechanics? Is there uncertainty in general relativity? This paper provides

**a contribution to unify classical logic and probability theory.**

*Key words:* Logic, Probability theory, Dialectics, Tensors, General relativity, Quantum mechanics, Dialectical tensor logic, Probabilistic logic, Probability logic

## 1. Background

**Classical logic** has been studied throughout the history of mankind. Although exact dates are uncertain, the first rules of formal logic descends from the Greek tradition and were written by Aristotle. The laws of classical logic, especially the three classic Aristotelian laws of thought (Boole 1854) are treated more or less as something dependent on **human mind** and consciousness. At this point, although the nature of logic is still an object of intense dispute, the laws of classical logic are nature grounded and mind independent. Classical logic investigates at the end the most basic and most general laws of nature. In opposite to classical logic, the development of **probability theory** is historical backgrounded by **practical things**, by games of chance in 17th century France. The scientific study of the laws of probability were influenced by Pierre de Fermat, Blaise Pascal (1654), Christiaan Huygens (1657), Jakob Bernoulli (Ars Conjectandi, posthumous, 1713), Abraham de Moivre (1718), Pierre-Simon Laplace (1774) and many others. The successful attempts of Kolmogorov and Cox to formalise probability are still not suitable to unified classical logic and probability theory. On this point of view, the usual quantum mechanics can be regarded something like a probability calculus resting upon logic. The empirical success of quantum mechanics calls for a unification of classical logic and probability theory to enable a fully relativistic quantum theory. This view is associated with the demand to unify quantum theory and relativity into one theory using the same tools, language and formulas. In particular, we must go beyond Aristotle, Boole, Kolmogorov and Cox, we must negate the same but equally preserve them too.

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## 2. Material and Methods

The mathematical tools which are presented in the following pages constitutes the farthest-reaching generalisation of classical logic and probability theory and are at the based upon the research on non-Euclidean manifolds by Riemann, Gauss and Christoffel which have been systematised by Ricci and Levi-Civita. The necessary new mathematical tools developed in this paper are presented in as simple and transparent manner as possible. A special study of the mathematical literature is useful but not required. The laws of classical logic and probability theory must be unified in such a way that they apply to any systems of references. In this case under consideration, the general laws of classical logic and probability theory are of such a nature that they are to be expressed by equations which hold good for both or for all systems (generally co-variant according to Einstein (Einstein 1916)). With this aim in view we will at the end develop mathematical tools that enable us to unify general relativity and quantum mechanics into one theory. Since Einstein's theory of general relativity is completely expressed in the language of tensors, this paper is based on the use of tensors too. Having seen the foregoing, the fundamental idea of this paper is thus the following :

Let a tensors be defined with respect to any system by a number of functions which are called the "components " of the tensor. There are certain rules by which these components can be calculated for a new system, if the transformation connecting the two systems is known and if they are known for the original system. The equations of transformation for the components of tensors are linear and homogeneous. Consequently, if all the components vanish in the original system, the components in the new system will vanish too.

The laws of nature may remain the same under any circumstances but this is not proofed and secured so far. Thus, to ensure the validity of that what follows in every reference frame, this paper is based only on **one postulate**: the constancy of the law of identity (in vacuo) or on  $A = A$  (in vacuo) or in accordance with Einstein, on the constancy of the velocity of light  $c = c$  (in vacuo).

### 2.1. Classical logic

Logic as nature grounded and mind-independent investigates and classifies the most basic, the most general and the most fundamental laws of nature. In so far, there must be a path to tensors too. The three classic laws of thought according to Aristotle are the law of contradiction, the law of the excluded middle and the law of identity. Thus let the last be the first.

#### 2.1.1. Identity law. *Lex identitatis*.

##### 2.1.1.1. *Self-identity and local hidden variable*

The law of identity or **lex identitatis** according to Barukčić (Barukčić 2006a, pp. 55-60, pp. 44-46) states that something like  $A_t$  at a (space) time  $t$  is identical only to itself, it is only itself and without anything else, it is **the 'purity' as such**, it is without the other of itself, it is without any form of a local hidden variable (Barukčić 2006a, pp. 55-60; Barukčić, 2006b) or

$$A_t = A_t. \quad (1)$$

$A_t$  is the simple equality with itself,  $A_t$  is only self-related and unrelated to an other, any relation to an other is removed, any relation to an other has vanished. In this way, there does not appear to be any relation to an other,  $A_t$  is distinct from any relation to an other and contains nothing other but only itself.

Consequently,  $A_t$  is in its own self only itself and nothing else and in so far the absence of any other determination. In this sense,  $A_t$  is identical only with itself,  $A_t$  is just the 'pure'  $A_t$ . The identity with itself has consequences. If  $A_t$  is only  $A_t$  and nothing else, then it is not equally the other of itself, it is not equally the local hidden variable of itself, it is not equally the negation of itself. The other, the local hidden part of  $A_t$ , the negative of  $A_t$ , is not as necessary as the  $A_t$  itself,  $A_t$  is not confronted by its other.  $A_t$  is without any opposition or contradiction, is not against an other, is not opposed to an other, is identical only with itself and has passed over into pure equality with itself or  $A_t$  is without any local hidden variable. But lastly, although  $A_t$  is identical only with itself it is equally somehow different, this identity with itself is in its own self different. It is a positive  $A_t$  that is identical with the positive  $A_t$ . But equally, it is the negative  $A_t$ , the is identical with the negative  $A_t$ . In so far, even if  $A_t$  is identical only with itself it is equally in its selfsameness different from itself and thus self-contradictory. Thus  $+A_t = +A_t$  excludes equally the other out of itself, it is not  $-A_t = -A_t$ . The identity with itself is based on the exclusion of the other of itself out of itself, it is based on the non-being as the non-being of its other. In excluding its own other ( $-A_t$ ) out of itself  $+A_t$  is excluding itself in its own self. By excluding its other,  $+A_t$  makes itself into the other of what it excludes from itself or  $+A_t$  makes itself into its own opposite,  $+A_t$  is thus simply the transition of itself into its opposite.  $+A_t$  is therefore alive only in so far as it contains such a contradiction within itself.

**Identity and otherness.**

Let

$A_t$  denote something, a Bernoulli random variable, that is either true ( $=+1$ ) or false ( $=+0$ ) at the (space)time  $t$ ,

$t$  denote a Bernoulli trial at the (space)time  $t$ ,

then

$$(A_t = A_t) = (A_t = (\text{Not}(\text{Not } A_t))) = ((A_t > (\text{Not } A_t)) \text{ Exclusive Or } (A_t < (\text{Not } A_t))).$$

**Proof.**

**Eq.**

Trial	$A_t$	$A_t$	<b>Not <math>A_t</math></b>	$A_t = A_t$	$A_t > (\text{Not } A_t)$	$A_t < (\text{Not } A_t)$	$((A_t > (\text{Not } A_t)) \text{ Exclusive Or } (A_t < (\text{Not } A_t)))$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1	1	1	0	1	1	0	1	( 2 )
2	0	0	1	1	0	1	1	( 3 )

**Q. e. d.**

The identity of  $+A_t$  with itself is based equally on the relation to the other of itself, to its own local hidden variable. It is not only true that the identity of  $A_t$  with itself is given if  $(A_t = A_t)$ , it is equally true that the identity of  $A_t$  with itself is given if **either**  $(A_t > (\text{Not } A_t))$  **or**  $(A_t < (\text{Not } A_t))$ . It is not possible that  $(A_t \cap (\text{Not } A_t)) = 1 = \text{true}$ . Thus, if the one is, the other is not and vice versa. The one is excluding its own other out of itself and vice versa. But equally, both are determined as distinguished from each other,  $A_t$  as the simple equality with itself, as something only self-related and unrelated to its own other is equally determined by its relation to its own other, by the exclusion of the other of itself out of itself. Consequently, even if  $(A_t = A_t)$ , the relation to its own other is not removed, the relation to its own other has not vanished. The identity of itself with itself is determined by the fact that

$$A_t = (A_t > (\text{Not } A_t)). \tag{4}$$

But lastly, although  $A_t$  is only identical with itself, the same  $A_t$  is in its selfsameness equally based on the difference to its own other. It is the same  $A_t$  that is in its own self different and thus self-contradictory.  $A_t$  in its selfsameness is distinct from its own other, its identity with itself is determined by this relation to its own other.

In accordance with Eq. (4)  $A_t > (\text{Not } A_t)$  or  $A_t$  is **greater than**  $(\text{Not } A_t)$ . This relation is known as a **strict inequality**. Recall, an inequality is reversed if both members of a inequality are divided or multiplied by a negative number. It is the same equality that is determined by an inequality or in other words. An equality has equally a relation to an inequality and vice versa.

**Anti-Gill I. An equal is determined by an unequal and vice versa.**

Let

- 1 denote the mathematical constant 1,
- $>$  denote the strict inequality which means greater than,
- $\geq$  denote the non-strict inequality which means either greater than or equal to,
- $<$  denote the strict inequality which means less than,
- $\leq$  denote the non-strict inequality which means either less than or equal,
- $=$  denote the strict inequality which means equal to,
- $\neq$  denote the disequality which means greater than,

then

$$(1 = 1) = 1 - (1 \neq 1).$$

**Proof.**

**Eq.**

Trial	1	$1 = 1$	$1 \neq 1$	$1 > 1$	$1 < 1$	$1 \geq 1$	$(1=1)+(1>1)$	$(1=1)+(1<1)$	$1 - (1 \neq 1)$
	(1)	(2)	(3)	(4)	(5)	(6)	$(7)=(6)=(1)+(4)$	$(8)=(1)+(5)$	$(9)=(2)=(1)-(3)$
1	1	1	0	0	0	1	1	1	1
2	1	1	0	0	0	1	1	1	1

(5)

(6)

**Q. e. d.**

In accordance to Eq. (5) and Eq. (6) Coll. (9) an equal is grounded on and unequal, the existence of the pure equality would be based on the absence of the disequality. Only a disequality differs from inequality, both are not the same.

**Anti-Gill II. An exclusive or is different from an inclusive or and vice versa.**

That is to say,  $(1 \geq 1)$  means  $(1 \geq 1) = \text{Either } (1 = 1) \text{ or } (1 > 1)$ .

Let

- 1 denote the mathematical constant 1,
- $>$  denote the strict inequality which means greater than,
- $\geq$  denote the non-strict inequality which means either greater than or equal to,
- $<$  denote the strict inequality which means less than,
- $\leq$  denote the non-strict inequality which means either less than or equal to,
- $=$  denote the equality which means equal to,
- $\neq$  denote the disequality which means greater than,

then

$$(1 \geq 1) = \text{Either } (1 = 1) \text{ or } (1 > 1) .$$

**Proof by contradiction.**

**Eq.**

Assumption:

$$(1 \geq 1) = ( (1 = 1) \text{ inclusive or } (1 > 1) ) \quad (7)$$

$$(1 \geq 1) = ( (1 = 1) \cup (1 > 1) ) \quad (8)$$

$$(1 \geq 1) = 1 - ( (1 - (1 = 1)) * (1 - (1 > 1)) ) \quad (9)$$

$$(1 \geq 1) = 1 - ( (1 - (1 = 1)) - (1 > 1) + ((1 = 1) * (1 > 1)) ) \quad (10)$$



$$(1 \geq 1) = 1 - 1 + (1 = 1) + (1 > 1) - ((1 = 1) * (1 > 1)) \tag{11}$$

$$(1 \geq 1) = (1 = 1) + (1 > 1) - ((1 = 1) * (1 > 1)) \tag{12}$$

The mathematical operation times ( \* ) is identical with the logical operation AND (  $\cap$  ) while we are using the numbers 0 or 1. Thus we obtain the next equation.

$$(1 \geq 1) = (1 = 1) + (1 > 1) - ((1 = 1) \cap (1 > 1)) \tag{13}$$

What is the meaning of the term  $((1 = 1) \cap (1 > 1))$ . The term  $((1 = 1) \cap (1 > 1))$  denotes the fact, that  $(1 = 1)$  and that  $(1 > 1)$  in the same respect, at the same time. Is it possible at all that the same 1 is equal to itself and not equal to itself, that  $(1 = 1)$  and that at the same time  $(1 > 1)$ ? Nonetheless, it is true that  $(1 = 1) = 1$ . In so far, we obtain the next equation.

$$(1 \geq 1) = (1 = 1) + (1 > 1) - ((1 \cap (1 > 1))) \tag{14}$$

$$(1 \geq 1) = (1 = 1) + (1 > 1) - (1 > 1) \tag{15}$$

$$(1 \geq 1) = (1 = 1) + 0 \tag{16}$$

In accordance with Eq. (5) and Eq. (6) Coll. (7) we obtain the next equation.

$$(1 = 1) + (1 > 1) = (1 = 1) \tag{17}$$

$$(1 > 1) = 0 \tag{18}$$

Our assumption was that  $(1 \geq 1)$  is determined by an **inclusive or** which is denoted as  $(1 = 1) \text{ OR } (1 > 1)$  is true as long as the term  $(1 > 1) = 0$ . Only, a disjunction is usually defined by two terms, both of them are equipotent, the one is not more powerful than the other. In so far, theoretically it is and must be possible that there is something like  $(1 > 1) = 1$  too. Consequently, if there would not exist something like  $(1 > 1) = 1$ , our assumption above that  $(1 \geq 1)$  is determined by an **inclusive or** would be grounded on a non-existent second term which is not in accordance with the definition of disjunction. In so far, let us assume that the term **(1>1)** exists, theoretically it must be possible that the same can be equal to 1, or  $(1 > 1) = 1$ . Otherwise we would misuse the disjunction. Thus, we obtain the next equation.

$$1 = 0. \tag{19}$$

Q. e. d.

Our assumption, that  $(1 \geq 1)$  is determined by an **inclusive or** leads straightforward into a logical contradiction. If we do not accept that  $(1 > 1)$ , which of course makes sense, since 1 is constant and doesn't change, then equally we cannot claim, that  $(1 \geq 1)$  is determined by an **inclusive or**. In this situation we must claim that,  $(1 \geq 1) = \text{Either } (1 = 1) \text{ or } (1 > 1)$ . If we put some light on the inequality  $(1 \leq 1)$ , the situation is the same. It is true that  $(1 \leq 1) = \text{Either } (1 = 1) \text{ or } (1 < 1)$ . This is very important, since in physics and other sciences too, inequalities plays a fundamental role. The things should not change that much is we analyse the relationship between a and b instead of 1.

$a \geq b$

The following 2 by 2 table gives an overview of the inequality  $a \geq b$ .

$a \geq b$		b	
		1	0
a	1	$(a = b)$	$(a > b)$
	0	$(a < b)$	$(a = b)$

<b>Table. <math>a \geq b</math></b>						
Without a no b.						
Trial	a	b	(a = b)	(a > b)	(a = b) $\cup$ (a > b)	(a $\leftarrow$ b)
1	1	1	1	0	1	1
2	1	0	0	1	1	1
3	0	1	0	0	0	0
4	0	0	1	0	1	1

The inequality  $\geq$  must be expressed as an **exclusive or** if the same deals about a constant (Eq. (19)) and at the same time, the inequality  $\geq$  must not be expressed as an **exclusive or** if a and b are not constant. In this case, the inequality  $\geq$  can be expressed by the terms of an **inclusive or** as can be seen in the table above. This is a contradiction.

In so far, in accordance to Eq. (5) and Eq. (6) Coll. (7) and the tables above, the relationship (  $a \geq b$  ) is determined by the conditio-sine-qua non relationship or (  $a \geq b$  ) = **without a no b**. This could be abbreviated as well as **either (  $a = b$  ) or (  $a > b$  )**, which is equally true. But, as proofed above, it is absolutely sure, that **we cannot reduced (  $a \geq b$  ) only to an inclusive or like (  $a = b$  )  $\cup$  (  $a > b$  )**.

#### $a \leq b$

The situation doesn't change that much, if we regard the term (  $a \leq b$  ). This inequality is based on the **conditio-per-quam** relationship (implication) as can be seen in the 2 by 2 table below.

$a \leq b$		b	
		1	0
a	1	( $a = b$ )	( $a > b$ )
	0	( $a < b$ )	( $a = b$ )

In accordance with the 2 by 2 table above, the relationship (  $a \leq b$  ) is determined by the conditio-per-quam relationship or (  $a \leq b$  ) = **when a then b**.

<b>Table. <math>a \leq b</math></b>						
When a then b.						
Trial	a	b	(a = b)	(a < b)	(a = b) $\cup$ (a < b)	(a $\rightarrow$ b)
1	1	1	1	0	1	1
2	1	0	0	0	0	0
3	0	1	0	1	1	1
4	0	0	1	0	1	1

2.1.1.2. Identity law and the law of independence

There is a relation between identity with itself and the law of independence. If  $A_t$  is identical only with itself, if  $A_t$  is only  $A_t$  and nothing else, if  $A_t$  is not equally the other of itself, then

**Identity and independence.**

Let

$A_t$  denote something, a Bernoulli random variable, that is either true ( $=+1$ ) or false ( $=+0$ ) at the (space)time  $t$ ,

$t$  denote a Bernoulli trial at the (space)time  $t$ ,

then

$$A_t \cap A_t = (A_t > (\text{Not } A_t)) = (A_t > (\text{Not } A_t)) \cap (\text{Not } (A_t < (\text{Not } A_t))).$$

**Proof.**

**Eq.**

Trial	$A_t$	$A_t$	Not $A_t$	$A_t \cap A_t$	$A_t > (\text{Not } A_t)$	$A_t < (\text{Not } A_t)$	$((A_t > (\text{Not } A_t)) \cap (\text{Not } (A_t < (\text{Not } A_t))))$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1	1	1	0	<b>1</b>	1	0	<b>1</b>	(20)
2	0	0	1	<b>0</b>	0	1	<b>0</b>	(21)

$$p(A_t) \quad p(A_t) \quad p((A_t) \cap (A_t)) \tag{22}$$

**Q. e. d.**

It is evident that according to Eq. (20) and Eq. (21) Coll. (1) and Coll. (4)

$$p(A_t) = p(A_t \cap A_t). \tag{23}$$

as long as  $A_t$  can change from  $A_t$  (trial 1) and to Not  $A_t$  (trial 2). This situation changes, if  $A_t$  cannot change at all, if  $A_t$  is all the (space) time **either**  $p(A_t) = 1$  **or**  $p(A_t) = 0$ . Thus, let  $A_t = 1$ , in so far it is evident that  $p(A_t) = 1$ .

**Identity and independence I.**

Let

$A_t$  denote something, a Bernoulli random variable, that is either true ( $=+1$ ) or false ( $=+0$ ) at the (space)time  $t$ ,

$t$  denote a Bernoulli trial at the (space)time  $t$ ,

then

$$A_t \cap A_t = (A_t = A_t) = (A_t > (\text{Not } A_t)) = ((A_t > (\text{Not } A_t)) \cap (A_t)).$$

**Proof.**

**Eq.**

Trial	$A_t$	$A_t$	Not $A_t$	$A_t \cap A_t$	$A_t > (\text{Not } A_t)$	$A_t = A_t$	$((A_t > (\text{Not } A_t)) \cap (A_t))$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1	1	1	0	1	1	1	1	(24)
2	1	1	0	1	1	1	1	(25)

$$p(A_t) \quad p(A_t) \quad p(\text{Not } A_t) \quad p((A_t) \cap (A_t)) \tag{26}$$

**Q. e. d.**

If that  $p(A_t) = 1$  then it is evident that

$$p(A_t) * p(A_t) = p(A_t \cap A_t). \quad (27)$$

$$((p(A_t) = 1) * (p(A_t) = 1)) - (p(A_t \cap A_t) = 1) = 0 \quad (28)$$

$$(1 * 1) - 1 = 0 \quad (29)$$

$$0 = 0 \quad (30)$$

If  $p(A_t) = 1$  then  $A_t$  is equally independent from itself. Any trial to change itself is without any success,  $A_t$  was  $A_t$ ,  $A_t$  is  $A_t$  and  $A_t$  will stay the same  $A_t$  for ever.  $A_t$  has successfully removed itself from Not  $A_t$  or sublates the same as something opposed to it, it is only  $A_t$  and nothing else.

$A_t$  in its self-sameness and without any relation to its own other cannot change under such circumstances. Since  $A_t$  as one which changes, as yet has not changed, as yet is not its other, would be only on the way to its other, to change to Not  $A_t$ . But again, that  $A_t$  which begins to change already is itself and equally too, is not as yet.

As yet there is only  $A_t$  and there is to become its other, the Not  $A_t$ , the  $A_t$  cannot be only the pure  $A_t$ , but an  $A_t$  from which something, the Not  $A_t$ , is to proceed; therefore the Not  $A_t$ , too, is already contained in the  $A_t$ .

The  $A_t$  therefore contains both,  $A_t$  and not  $A_t$ ,  $A_t$  is the unity of  $A_t$  and not  $A_t$ ; or is Not  $A_t$  which is equally  $A_t$ , and  $A_t$  which is equally not  $A_t$ ,  $A_t$  is the union of itself with its negative,  $A_t$  is its otherness,  $A_t$  is equally its local hidden variable.

### The law of excluded middle and the law of independence I.

Let

$A_t$  denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time  $t$ ,

$p(A_t)$  denote the probability of something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time  $t$ .  
Even if  $p(A_t) = 1$ , in the case of independence, the law of excluded middle is valid,

then

$$1 - ((1 - p(A_t)) * (1 - p(\text{Not } A_t))) = 1.$$

**Proof.**

$$p(A_t) = 1 \quad (31)$$

$$1 - p(A_t) = 0 \quad (32)$$

In accordance with Eq. (26), Col. (3) it is equally true that  $p(\text{Not } A_t) = 0$ , if  $p(A_t) = 1$ . Thus, we obtain the next equation.

$$1 - p(A_t) = p(\text{Not } A_t) \quad (33)$$

$$p(A_t) + p(\text{Not } A_t) = 1 \quad (34)$$

$$p(A_t) + p(\text{Not } A_t) - 0 = 1 \quad (35)$$

If  $p(A_t) = 1$  then  $p(\text{Not } A_t) = 0$  and  $((p(A_t) * p(\text{Not } A_t)) = 0)$ . We obtain the next equation.

$$p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \quad (36)$$

$$0 + p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \quad (37)$$

$$+1 - 1 + p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \quad (38)$$

$$1 - (1 - p(A_t) - p(\text{Not } A_t) + (p(A_t) * p(\text{Not } A_t))) = 1 \quad (39)$$

$$1 - ((1 - p(A_t)) * (1 - p(\text{Not } A_t))) = 1 \quad (40)$$

**Q. e. d.**

In so far, even if  $p(A_t) = 1$ , if  $A_t$  is independent from itself, the otherness of itself back in itself and equally excluded the same out of itself,  $A_t$  is equally the unity of itself and its other, it is equally the relation to its otherness within itself.

$A_t$  passes over into its own other, through its relation to its own other, in its relation to its own other its alteration begins. In accordance with Eq. (40), the law of the excluded middle is valid even in a world where  $p(A_t) = 1$ . In such a world, the laws of probability theory breaks down or are at least useless, in such a world, the laws of classical logic are needed and useful to explain this world. In this context, the correct and precise definition of inequalities is very important, otherwise we will reach erroneous results. Let us assume that the pure  $A_t$  is the unity into which the union of  $A_t$  itself with its negative, with its otherness, with its local hidden variable has collapsed at the extreme point of their union with each other, then probability theory has vanished in that unity too, leaving behind nothing but the pure logic.

In so far if  $p(A_t) = 1$  is the point, where probability theory ends, it is equally the point, where classical logic begins and vice versa. If  $p(A_t) < 1$  is the point, where classical logic ends, it is equally the point, where probability theory begins and vice versa.

It may be that there is a world governed either by 0 or by 1 but equally too, there is a world between 0 and 1. In so far, classical logic and probability theory need each other for their existence, the one cannot without the other and vice versa, both are at the end governed by the same laws, both should speak the same language, both should use the same mathematical framework.

The situation is not that much an other if  $p(A_t) = 0$ . Even if  $p(A_t) = 0$  then  $A_t$  is independent from itself and the laws of classical logic are valid.

$$p(A_t) * p(A_t) = p(A_t \cap A_t) \quad (41)$$

$$((p(A_t) = 0) * (p(A_t) = 0)) - (p(A_t \cap A_t) = 0) = 0 \quad (42)$$

$$(0 * 0) - 0 = 0 \quad (43)$$

$$0 = 0 \quad (44)$$

The law of the excluded middle is valid even in the case of independence.

**The law of excluded middle and the law of independence II.****Let**

$A_t$  denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time  $t$ ,

$p(A_t)$  denote the probability of something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time  $t$ . Even if  $p(A_t) = 0$ , in the case of independence, the law of excluded middle is valid,

then

$$1 - ((1 - p(A_t)) * (1 - p(\text{Not } A_t))) = 1.$$

**Proof.**

$$p(A_t) = 0 \quad (45)$$

$$p(A_t) = 1 - 1 \quad (46)$$

$$1 - p(A_t) = 1 \quad (47)$$

In accordance with Eq. (26), Col. (3) it is equally true that  $p(\text{Not } A_t) = 1$ , if  $p(A_t) = 0$ . Thus, we obtain the next equation.

$$1 - p(A_t) = p(\text{Not } A_t) \quad (48)$$

$$p(A_t) + p(\text{Not } A_t) = 1 \quad (49)$$

$$p(A_t) + p(\text{Not } A_t) - 0 = 1 \quad (50)$$

If  $p(A_t) = 0$  then  $p(\text{Not } A_t) = 1$  and  $((p(A_t) * p(\text{Not } A_t)) = 0)$ . We obtain the next equation.

$$p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \quad (51)$$

$$0 + p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \quad (52)$$

$$+1 - 1 + p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \quad (53)$$

$$1 - (1 - p(A_t) - p(\text{Not } A_t) + (p(A_t) * p(\text{Not } A_t))) = 1 \quad (54)$$

$$1 - ((1 - p(A_t)) * (1 - p(\text{Not } A_t))) = 1 \quad (55)$$

**Q. e. d.**

### 2.1.2. Negation Law. Lex negationis.

The quantum field theory provides the mathematical framework for the Standard Model of particle physics. The Standard Model of particle physics is the theory of fundamental interactions between particles today but it lacks as such **the inclusion of gravity** and is at the end not consistent with both quantum mechanics and special relativity.

Elementary particles that make up all matter, change and develop under certain conditions, even symmetry can spontaneously be broken. Situations where particles may be created and destroyed are governed by natural laws valid in micro- and macrophysics.

The dynamical creation and annihilation of particles which is a crucial aspect of relativity is a natural process. But at the end both processes, creation and annihilation, are based on the most basic processes in nature, on causation and negation.

In so far, if something and its other collide and disappear (a particle and its antiparticle), they don't pass over into nothing, they release at least energy and time. The amount of energy ( $E$ ) produced by negation or annihilation of particles is a special case of negation and has to do with general relativity and Einstein's famous mass-energy relation.

In so far, there should be a path between negation, annihilation, Einstein's relativistic correction and the logical negation.

In mathematics and classical logic, negation is an operation on logical values like 0 and 1 or a natural process that converts true (=1) to false (=0) and false (=0) to true (=1), the one is created, the other is annihilated. The following table of Not  $A_t$  (also written as  $\sim A_t$  or  $\neg A_t$ ) is a proof of the equivalence of **Not  $A_t = 1 - A_t$** .

**Negation.**

**Let**

$A_t$  denote something, a Bernoulli random variable, that is either true (=1) or false (=0) at the (space)time  $t$ ,

Not  $A_t$  denote the logical negation of  $A_t$  that is either true (=1) or false (=0) at the (space)time  $t$ ,

$t$  denote the (space)time  $t$ ,

then

$$(\text{Not } A_t) = 1 - A_t.$$

**Proof.**

$A_t$	$(\text{Not } A_t)$	$(1 - A_t)$	Equation
(1)	(2)	(3)	
1	0	0	(56)
0	1	1	(57)

**Q. e. d.**

No matter how the logical negation is notated, in bivalent logic it is equally true that **Not  $A_t = (1 - A_t)$** . It is important to stress that the logical negation converts **either 0 to 1 or 1 to 0**, something in its own other, the one is created, the other is annihilated and vice versa. How powerful must negation be to change something in its own other. Negation as such is changing something in an other and must have to do something with causation. The logical negation can be defined in terms of algebra.

**Negation and algebra I.**

Let

$A_t$  denote something that is either true (=1) or false (=0) at the (space)time  $t$ ,

$\text{Not } A_t$  denote logical negation of  $A_t$  that is either true (=1) or false (=0) at the (space)time  $t$ ,

$C_t$  denote something other at the (space)time  $t$ ,

$t$  denote the (space) time  $t$ .

Let us respect the law of the excluded middle,

then

$$\mathbf{Anti } A_t = \mathbf{Not } A_t = C_t - A_t.$$

**Proof.**

$$+ A_t = + A_t \quad \text{Equation (58)}$$

$$- A_t = - A_t \quad (59)$$

$$C_t - A_t = C_t - A_t \quad (60)$$

We define  $C_t - A_t = \text{Anti } A_t = \text{Not } A_t$ . Thus, we obtain the next equation.

$$\mathbf{Anti } A_t = \mathbf{Not } A_t = C_t - A_t \quad (61)$$

**Q. e. d.**

**Negation and algebra II.**

Let

$A_t$  denote something that is either true (=1) or false (=0) at the (space)time  $t$ ,

$\text{Anti } A_t$  denote the negation of  $A_t$  that is either true (=1) or false (=0) at the (space)time  $t$ , the otherness of  $A_t$ , the local hidden variable of  $A_t$  etc. at the (space)time  $t$ ,

$C_t$  denote something other at the (space)time  $t$ ,

$t$  denote the (space) time  $t$ .

Let us respect the law of the excluded middle,

then

$$\mathbf{A}_t + (\mathbf{Anti } A_t) = C_t.$$



**Proof.**

$$+ A_t = + A_t \quad \text{Equation (62)}$$

$$+A_t - A_t = 0 \quad \text{(63)}$$

$$+A_t - A_t = +C_t - C_t \quad \text{(64)}$$

$$+C_t + A_t - A_t = +C_t \quad \text{(65)}$$

$$A_t + C_t - A_t = C_t \quad \text{(66)}$$

Our assumption is that we respect the law of the excluded middle. In so far, in accordance to Eq. (61), we obtain the next equation.

$$A_t + (\text{Anti } A_t) = C_t \quad \text{(67)}$$

**Q. e. d.**

**Tertium non datur**, there is no third between  $A_t$  and Anti  $A_t$ . In so far, in accordance with Kolmogorov  $A_t$  and Anti  $A_t$  "have no element in common" (Kolmogorov 1933, p. 2; p. 6). In so far, according to Kolmogorov's Axiom IV and V it is true that

$$p(C_t = A_t + \text{Anti } A_t) = p(A_t) + p(\text{Anti } A_t) = 1.$$

		p( Anti $A_t$ )		
		0	1	
p( $A_t$ )	1	1	0	p( $A_t$ )
	0	0	1	p( Anti $A_t$ )
		p( $A_t$ )	p( Anti $A_t$ )	1

**Negation and Einstein's relativistic correction.**

Let

 $X_t$  denote something existing independently of human mind and consciousness at the (space)time  $t$ , $\Delta(X_t)^2$  denote the inner contradiction of  $X_t$ ,Anti  $X_t$  denote Anti something existing independently of human mind and consciousness at the (space)time  $t$ , $\Delta(\text{Anti } X_t)^2$  denote the inner contradiction of Anti  $X_t$ , $C_t$  denote the unity of  $X_t$  and Anti  $X_t$ . Recall, that  $X_t + (\text{Anti } X_t) = C_t$ . Let $v$  denote the velocity,Anti  $v$  denote the anti velocity, $c$  denote the speed of the light, $t$  denote the (space)time  $t$ ,

then

$$(1 - ((X_t)^2 / (C_t)^2))^{1/2} = (1 - ((X_t)^2 / (C_t)^2))^{1/2}.$$

**Proof.**

Equation

$$0 \quad (68)$$

$$-1 + 1 = 0 \quad (69)$$

$$-1 = -1 \quad (70)$$

$$+1 = +1 \quad (71)$$

$$+ X_t = + X_t \quad (72)$$

$$+ X_t - X_t = 0 \quad (73)$$

$$+ X_t - X_t = + C_t - C_t \quad (74)$$

$$+ X_t + C_t - X_t = + C_t \quad (75)$$

$$+ X_t + (\text{Anti } X_t) = + C_t \quad (76)$$

$$(+ X_t + (\text{Anti } X_t))^2 = (+ C_t)^2 \quad (77)$$

$$(+ X_t + (\text{Anti } X_t))^2 / (+ C_t)^2 = 1 \quad (78)$$

$$((X_t)^2 + (2 * (X_t) * (\text{Anti } X_t)) + (\text{Anti } X_t)^2) / (+ C_t)^2 = 1 \quad (79)$$

$$((2 * (X_t) * (\text{Anti } X_t)) + (\text{Anti } X_t)^2) / (C_t)^2 = 1 - ((X_t)^2 / (C_t)^2) \quad (80)$$

$$((\text{Anti } X_t) * (2 * (X_t) + (\text{Anti } X_t))) / (C_t)^2 = 1 - ((X_t)^2 / (C_t)^2) \quad (81)$$

$$((\text{Anti } X_t) * ((X_t) + (X_t) + (\text{Anti } X_t))) / (C_t)^2 = 1 - ((X_t)^2 / (C_t)^2) \quad (82)$$

$$((\text{Anti } X_t) * ((X_t) + (C_t))) / (C_t)^2 = 1 - ((X_t)^2 / (C_t)^2) \quad (83)$$

$$(((C_t) - (X_t)) * ((C_t) + (X_t))) / (C_t)^2 = 1 - ((X_t)^2 / (C_t)^2) \quad (84)$$

$$((C_t)^2 - (X_t)^2) / (C_t)^2 = 1 - ((X_t)^2 / (C_t)^2) \quad (85)$$

$$1 - ((X_t)^2 / (C_t)^2) = 1 - ((X_t)^2 / (C_t)^2) \quad (86)$$

$$(1 - ((X_t)^2 / (C_t)^2))^{1/2} = (1 - ((X_t)^2 / (C_t)^2))^{1/2} \quad (87)$$

**Q. e. d.**

Set  $X_t = v$  and  $C_t = c$ , then  $(1 - ((X_t)^2 / (C_t)^2))^{1/2} = (1 - ((v)^2 / (c)^2))^{1/2}$  and we arrived at Einstein's relativistic correction. In so far, Einstein's relativistic correction is based on the identity law too. On the other hand, the same has the ability to change since  $\text{Anti } X_t = X_0 = X_t * ((1 - ((X_t)^2 / (C_t)^2))^{1/2})$ . Let us assume, we have only the pure  $X_t$ , in this case it is  $X_t = C_t$ . We obtain according to Einstein, Barukčić (Barukčić 2006a, pp. 64-65) and the equation above

$$\text{Anti } X_t = X_0 = ((1 - ((X_t)^2 / (C_t)^2))^{1/2}) * X_t = ((1 - 1)^{1/2}) * X_t = 0.$$

### 2.1.3. Law of contradiction. Lex contradictions.

Is it possible at all that one and the same particle is at the same (space)time positive and negative, that it is and equally it is not, that something is equal to itself ( $1=1$ ) **and** at the same time not equal ( $1 > 1$ ) to itself? The law of contradiction as one of the basic laws of nature and thus of classical logic too, states that it is not possible that one and the same something ( **is and equally is not** ) at the same (space) time. The law of contradiction can be expressed in terms of classical logic as:

$$\begin{aligned} \mathbf{A_t * ( Anti A_t )} &= \mathbf{0} \\ \text{or} \\ 1 - (\mathbf{A_t * ( Anti A_t )}) &= 1 \\ \text{or} \\ \mathbf{Anti (A_t and ( Anti A_t ))} &= 1 \\ \text{or} \\ \mathbf{Anti (A_t \wedge ( Anti A_t ))} &= 1. \end{aligned}$$

#### Law of contradiction.

Let

$A_t$  denote something that is either true ( $=1$ ) or false ( $=0$ ) at the (space)time  $t$ ,

$Anti A_t$  denote (logical) negation of  $A_t$  that is either true ( $=1$ ) or false ( $=0$ ) at the (space)time  $t$ ,

$t$  denote the (space)time  $t$ ,

then

$$\mathbf{( A_t * ( Anti A_t ) ) = 0 .}$$

#### Proof.

$$\mathbf{A_t = A_t} \quad \text{Equation ( 88 )}$$

$$\mathbf{A_t - A_t = 0} \quad \text{( 89 )}$$

Recall that  $1^2 = 1$  or  $0^2 = 0$ . Since  $A$  is either 0 or 1 it is equally true that  $A^2 = A$ . We obtain

$$\mathbf{A_t - ( A_t )^2 = 0} \quad \text{( 90 )}$$

$$\mathbf{A_t - (A_t * A_t ) = 0} \quad \text{( 91 )}$$

$$\mathbf{A_t * ( 1 - (A_t ) ) = 0} \quad \text{( 92 )}$$

Recall, that  $Anti A_t = 1 - A_t$  thus we obtain

$$\mathbf{A_t * ( Anti A_t ) = 0.} \quad \text{( 93 )}$$

#### Q. e. d.

The law of contradiction is based on the identity law and can be derived from the same.

**The inner contradiction of A and Anti A I.**

Let

$A_t$  denote something at the (space)time  $t$ ,  
 $\Delta(A_t)^2$  denote the inner contradiction of  $A_t$ ,  
 $\text{Anti } A_t$  denote (logical) negation of  $A_t$  at the (space)time  $t$ ,  
 $\Delta(\text{Anti } A_t)^2$  denote the inner contradiction of  $\text{Anti } A_t$ ,  
 $C_t$  denote the unity of  $A_t$  and  $\text{Anti } A_t$ . Let  $A_t + (\text{Anti } A_t) = C_t$ . Let  
 $t$  denote the (space)time  $t$ ,

then

$$\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.$$

**Proof.****Equation**

$$-0 = -0 \quad -0 = -0 \quad (94)$$

$$+0 = +0 \quad +0 = +0 \quad (95)$$

$$+1 - 1 = +0 \quad +1 - 1 = +0 \quad (96)$$

$$+1 = +1 \quad +1 = +1 \quad (97)$$

$$+A_t = +A_t \quad +A_t = +A_t \quad (98)$$

$$+A_t - A_t = 0 \quad +A_t - A_t = 0 \quad (99)$$

$$+A_t - A_t = +C_t - C_t \quad +A_t - A_t = +C_t - C_t \quad (100)$$

$$+A_t + C_t - A_t = +C_t \quad +A_t + C_t - A_t = +C_t \quad (101)$$

$$\text{Set Anti } A_t = +C_t - A_t \quad \text{Set Anti } A_t = +C_t - A_t \quad (102)$$

$$+A_t + (\text{Anti } A_t) = +C_t \quad +A_t + (\text{Anti } A_t) = +C_t \quad (103)$$

$$+A_t = +C_t - (\text{Anti } A_t) \quad +\text{Anti } A_t = +C_t - (A_t) \quad (104)$$

**Let  $+A_t \neq 0$ .****Let  $\text{Anti } A_t \neq 0$ .**

$$(+C_t - (\text{Anti } A_t)) / (+A_t) = +1 \quad (+C_t - A_t) / (+\text{Anti } A_t) = +1 \quad (105)$$

$$+1 = +1 \quad (106)$$

$$(C_t - (\text{Anti } A_t)) / (A_t) = 1 = (C_t - A_t) / (\text{Anti } A_t) \quad (107)$$

$$(\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) / (A_t) = (\text{Anti } A_t) * 1 = (C_t - A_t) \quad (108)$$

$$(\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) = (A_t) * (\text{Anti } A_t) = (A_t) * (C_t - A_t) \quad (109)$$

$$\text{Define } \Delta(\text{Anti } A_t)^2 = (A_t) * (\text{Anti } A_t). \quad (110)$$

$$\Delta(\text{Anti } A_t)^2 = (A_t) * (\text{Anti } A_t) = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) \quad (111)$$

$$\text{Define } \Delta(A_t)^2 = (A_t) * (\text{Anti } A_t). \quad (112)$$

$$\Delta(A_t)^2 = (A_t) * (\text{Anti } A_t) = (A_t) * (C_t - A_t) \quad (113)$$

$$\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2. \quad (114)$$

**Q. e. d.**

**The inner contradiction of A and Anti A II.**

Let

$A_t$  denote something at the (space)time  $t$ ,  
 $\Delta(A_t)^2$  denote the inner contradiction of  $A_t$ ,  
 $\text{Anti } A_t$  denote (logical) negation of  $A_t$  at the (space)time  $t$ ,  
 $\Delta(\text{Anti } A_t)^2$  denote the inner contradiction of  $\text{Anti } A_t$ ,  
 $C_t$  denote the unity of  $A_t$  and  $\text{Anti } A_t$ . Let  $A_t + (\text{Anti } A_t) = C_t$ . Let  
 $t$  denote the (space)time  $t$ ,

then

$$\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.$$

**Proof.**

Equation

$$-0 = -0 \quad (115)$$

$$+0 = +0 \quad (116)$$

$$+1 - 1 = +0 \quad (117)$$

$$+ 1 = + 1 \quad (118)$$

$$+A_t = +A_t \quad (119)$$

$$(\text{Anti } A_t) * A_t = (\text{Anti } A_t) * A_t \quad (120)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * A_t \quad (121)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) \quad (122)$$

$$(C_t * A_t) - (A_t)^2 = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2 \quad (123)$$

$$\text{Recall, } \Delta(\text{Anti } A_t)^2 = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2. \quad (124)$$

$$(C_t * A_t) - (A_t)^2 = \Delta(\text{Anti } A_t)^2. \quad (125)$$

$$\text{Recall, } \Delta(A_t)^2 = (C_t * A_t) - (A_t)^2 = (A_t) * (\text{Anti } A_t). \quad (126)$$

$$\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2. \quad (127)$$

**Q. e. d.**

It is allowed to multiply something with 0. Thus, according to the proof above and contrary to the previous proof, even if  $\text{Anti } A_t = 0$ , we obtain the identity of the inner contradiction of  $A_t$  and  $\text{Anti } A_t$ . In so far, the inner contradiction of  $A_t$  and  $\text{Anti } A_t$  is that what tightens both together, is the foundation of identity and the difference of  $A_t$  and  $\text{Anti } A_t$ . The inner contradiction is valid and active in world governed by pure classical logic and equally in a world governed by probability theory too. The variance of something appears in this context not to be necessary.

**The inner contradiction and the variance of A and Anti A.**

Let

$A_t$  denote something that is either true (=1) or false (=0) at the (space)time  $t$ ,  
 $\Delta(A_t)^2$  denote the inner contradiction of  $A_t$ ,  
 $\text{Anti } A_t$  denote (logical) negation of  $A_t$  that is either true (=1) or false (=0) at the (space)time  $t$ ,  
 $\Delta(\text{Anti } A_t)^2$  denote the inner contradiction of  $\text{Anti } A_t$ ,  
 $C_t$  denote the unity of  $A_t$  and  $\text{Anti } A_t$ . Let  $A_t + (\text{Anti } A_t) = C_t$ , tertium non datur. Let  
 $\sigma(A_t)^2$  denote the variance  $A_t$ ,  
 $t$  denote the (space)time  $t$ ,

then

$$\sigma(A_t)^2 = \Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2$$

**Proof.**

Equation

$$-0 = -0 \quad (128)$$

$$+0 = +0 \quad (129)$$

$$+1 - 1 = +0 \quad (130)$$

$$+ 1 = + 1 \quad (131)$$

$$+A_t = +A_t \quad (132)$$

$$(\text{Anti } A_t) * A_t = (\text{Anti } A_t) * A_t \quad (133)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * A_t \quad (134)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) \quad (135)$$

$$(C_t * A_t) - (A_t)^2 = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2 \quad (136)$$

Recall,  $\Delta(\text{Anti } A_t)^2 = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2$ .

$$(C_t * A_t) - (A_t)^2 = \Delta(\text{Anti } A_t)^2. \quad (137)$$

$$\text{Recall, } \Delta(A_t)^2 = (C_t * A_t) - (A_t)^2 = (A_t) * (\text{Anti } A_t). \quad (138)$$

$$\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2. \quad (139)$$

$$\Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 = ((A_t) * (\text{Anti } A_t)) / (C_t)^2. \quad (140)$$

$$\sigma(A_t)^2 = \Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 = ((A_t) * (\text{Anti } A_t)) / (C_t)^2. \quad (141)$$

$$\sigma(A_t)^2 = \Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 \quad (142)$$

$$\sigma(A_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 \quad (143)$$

**Q. e. d.**

The inner contradiction of general right triangle.

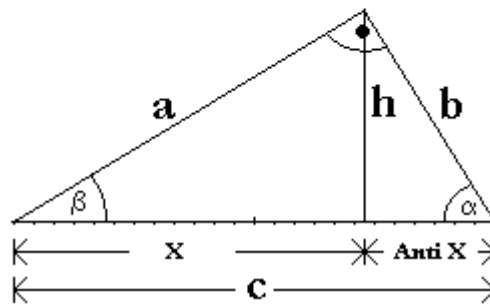
## General right triangle

A triangle with an angle of  $90^\circ$ . The sides  $a$ ,  $b$  and  $c$  satisfy the Pythagorean theorem

$$a^2 + b^2 = c^2.$$

$$\alpha + \beta = \gamma = 90^\circ$$

$$\alpha * \beta \leq (\gamma^2 / 4)$$



Let

$X_t$  denote length as illustrated above at the (space)time  $t$ ,

$\Delta(X_t)^2$  denote the inner contradiction of  $X_t$ ,

Anti  $X_t$  denote Anti length as illustrated above at the (space)time  $t$ ,

$\Delta(\text{Anti } X_t)^2$  denote the inner contradiction of Anti  $X_t$ ,

$C_t$  denote the hypotenuse of the general right triangle above, the unity of  $X_t$  and Anti  $X_t$ . Recall, that  $X_t + (\text{Anti } X_t) = C_t$ . Let

$a$  denote the one side of the general right triangle,

$b$  denote the other side of the general right triangle,

$h$  denote height of the right triangle as illustrated above,

Recall,  $h^2 = X_t * (\text{Anti } X_t)$ ,  $a^2 = C_t * X_t$ ,  $b^2 = C_t * (\text{Anti } X_t)$  as illustrated above. Let

$A$  denote the area of the general right triangle above. Recall,  $A = (C_t * h) / 2 = (a * b) / 2$ .  
Let

$t$  denote the (space)time  $t$ ,

then

$$\Delta(X_t)^2 = \Delta(\text{Anti } X_t)^2 = h^2.$$

**Proof.**

$$-0 = -0 \quad \text{Equation (144)}$$

$$+0 = +0 \quad \text{(145)}$$

$$+1 - 1 = +0 \quad \text{(146)}$$

$$+ 1 = + 1 \quad (147)$$

$$+\mathbf{X}_t = +\mathbf{X}_t \quad (148)$$

$$(\text{Anti } X_t) * X_t = (\text{Anti } X_t) * X_t \quad (149)$$

$$(C_t - X_t) * X_t = (\text{Anti } X_t) * X_t \quad (150)$$

$$(C_t - X_t) * X_t = (\text{Anti } X_t) * (C_t - (\text{Anti } X_t)) \quad (151)$$

$$(C_t * X_t) - (X_t)^2 = (C_t * (\text{Anti } X_t)) - (\text{Anti } X_t)^2 \quad (152)$$

$$\text{Recall, } \Delta(\text{Anti } X_t)^2 = (\text{Anti } X_t) * (C_t - (\text{Anti } X_t)) = (C_t * (\text{Anti } X_t)) - (\text{Anti } X_t)^2. \quad (153)$$

$$(C_t * X_t) - (X_t)^2 = \Delta(\text{Anti } X_t)^2. \quad (154)$$

$$\text{Recall, } \Delta(X_t)^2 = (C_t * X_t) - (X_t)^2 = (\mathbf{X}_t) * (\mathbf{Anti } \mathbf{X}_t). \quad (155)$$

$$\Delta(\mathbf{X}_t)^2 = \Delta(\mathbf{Anti } \mathbf{X}_t)^2. \quad (156)$$

$$(X_t) * (\text{Anti } X_t) = (C_t * X_t) - (X_t)^2 = (C_t * (\text{Anti } X_t)) - (\text{Anti } X_t)^2 \quad (157)$$

$$\text{Recall, } a^2 = (C_t * X_t) \quad (158)$$

$$(X_t) * (\text{Anti } X_t) = a^2 - (X_t)^2 = (C_t * (\text{Anti } X_t)) - (\text{Anti } X_t)^2 \quad (159)$$

$$\text{Recall, } b^2 = (C_t * (\text{Anti } X_t)) \quad (160)$$

$$(X_t) * (\text{Anti } X_t) = a^2 - (X_t)^2 = b^2 - (\text{Anti } X_t)^2 \quad (161)$$

$$\text{Recall, } h^2 = (X_t) * (\text{Anti } X_t). \quad (162)$$

$$h^2 = (X_t) * (\text{Anti } X_t) = a^2 - (X_t)^2 = b^2 - (\text{Anti } X_t)^2 \quad (163)$$

$$\Delta(X_t)^2 = \Delta(\text{Anti } X_t)^2 = h^2 = (X_t) * (\text{Anti } X_t) = a^2 - (X_t)^2 = b^2 - (\text{Anti } X_t)^2 \quad (164)$$

$$\Delta(\mathbf{X}_t)^2 = \Delta(\mathbf{Anti } \mathbf{X}_t)^2 = \mathbf{h}^2. \quad (165)$$

**Q. e. d.**

The square of the height  $h$  of a general right triangle as illustrated above is the measure of the inner contradiction of a general right triangle. If a gravitational or electromagnetic field is organised in the form of a general right triangle, the inner contradiction of the same can be calculated as proved above. It appears to me, that the triangle is the optical counterpart of logical contradiction. It is the reason, why I proposed the sign  $\Delta$  for **inner contradiction** of something, of a random variable, of a tensor, of ... The inner contradiction of something, of a random variable, of a tensor ... is not absolutely the same like the logical contradiction or the dialectical contradiction.



### 2.1.4. Law of the excluded middle. Tertium non datur.

The law of the excluded middle as one of the basic laws of nature and thus of classical logic too, states that a third between two opposites is not given, tertium non datur. There is no third between a charged and a not charged. If something is charged, then there is no third between a positive and a negative etc.

#### Law of the excluded middle.

Let

$A_t$  denote something at the (space)time  $t$ ,

Anti  $A_t$  denote (logical) negation of  $A_t$  at the (space)time  $t$ ,

$C_t$  denote the unity of  $A_t$  and Anti  $A_t$ ,

$t$  denote the (space)time  $t$ ,

then

$$+A_t + ( \text{Anti } A_t ) = +C_t$$

**Proof.**

Equation

$$+0 = +0 \quad (166)$$

$$+1 - 1 = +0 \quad (167)$$

$$+ 1 = + 1 \quad (168)$$

$$+A_t = +A_t \quad (169)$$

$$+A_t - A_t = 0 \quad (170)$$

$$+A_t - A_t = +C_t - C_t \quad (171)$$

$$+A_t + C_t - A_t = +C_t \quad (172)$$

$$\text{Set Anti } A_t = +C_t - A_t \quad (173)$$

$$+A_t + ( \text{Anti } A_t ) = +C_t \quad (174)$$

**Q. e. d.**

In so far, if it is true that  $A_t + ( \text{Anti } A_t ) = C_t$ , it is at the same time equally true, that there is no third between  $A_t$  and  $( \text{Anti } A_t )$ . Every equation that is based on tertium non datur states something like  $A_t + ( \text{Anti } A_t ) = C_t$  or like  $( \text{constant/s}_1 ) * A_t + ( \text{constant/s}_2 ) * ( \text{Anti } A_t ) = ( \text{constant/s}_3 ) * C_t$ . Einstein's field equation is based on the law of the excluded middle or on **tertium non datur** too. Contrary to Bell, Einstein is respecting the laws of classical logic (Barukčić 2006d).

**Tertium non datur.**

Let

 $A_t$  denote something at the (space)time  $t$ , $\text{Anti } A_t$  denote (logical) negation of  $A_t$  at the (space)time  $t$ , $C_t$  denote the unity of  $A_t$  and  $\text{Anti } A_t$ . Let  $A_t + (\text{Anti } A_t) = C_t$ . Let $\text{Tertium}$  denote a third between  $A_t$  and  $\text{Anti } A_t$ , $t$  denote the (space)time  $t$ ,

then

$$+ \text{Tertium}_t = 0.$$

**Proof.**

$$+0 = +0 \quad \text{Equation (175)}$$

$$+1 - 1 = +0 \quad (176)$$

$$+ 1 = + 1 \quad (177)$$

$$+A_t = +A_t \quad (178)$$

$$+A_t - A_t = 0 \quad (179)$$

$$+A_t - A_t = +C_t - C_t \quad (180)$$

$$+A_t + C_t - A_t = +C_t \quad (181)$$

Recall, that  $\text{Anti } A_t = +C_t - A_t$ 

$$+A_t + (\text{Anti } A_t) = +C_t \quad (182)$$

Let us assume that there is a third denoted by **Tertium** <sub>$t$</sub>  between  $A_t$  and  $\text{Anti } A_t$ . We obtain the next equation.

$$+A_t + (\text{Anti } A_t) + \text{Tertium}_t = +C_t \quad (183)$$

$$+A_t + \text{Tertium}_t = +C_t - (\text{Anti } A_t) \quad (184)$$

$$+A_t + \text{Tertium}_t = +A_t \quad (185)$$

$$+ \text{Tertium}_t = +A_t - A_t \quad (186)$$

$$+ \text{Tertium}_t = 0 \quad (187)$$

**Q. e. d.**

**Law of the excluded middle.****Let**

$A_t$  denote something that at the (space)time  $t$ ,  
 Anti  $A_t$  denote (logical) negation of  $A_t$  that at the (space)time  $t$ ,  
 $C_t$  denote something other at the (space)time  $t$ . Let  
 $t$  denote the (space)time  $t$ ,  
 then

$$(C_t)^2 - ((C_t - A_t) * (C_t - (\text{Anti } A_t))) = (C_t)^2.$$

**Proof.**

$$A_t = A_t \quad \text{Equation (188)}$$

$$A_t - A_t = 0 \quad (189)$$

$$C_t + A_t - A_t = C_t \quad (190)$$

$$A_t + C_t - A_t = C_t \quad (191)$$

Recall, that  $\text{Anti } A_t = C_t - A_t$  thus we obtain

$$A_t + (\text{Anti } A_t) = C_t \quad (192)$$

$$(C_t)*(A_t) + (C_t)*(\text{Anti } A_t) = (C_t)^2 \quad (193)$$

$$(C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - 0 = (C_t)^2 \quad (194)$$

According to the law of contradiction, it is true that  
 $(A_t * (\text{Anti } A_t)) = 0$ . Thus we obtain

$$(C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (195)$$

$$0 + (C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (196)$$

$$(C_t)^2 - (C_t)^2 + (C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (197)$$

$$(C_t)^2 - ((C_t)^2 - (C_t)*(A_t) - (C_t)*(\text{Anti } A_t) + (A_t * (\text{Anti } A_t))) = (C_t)^2 \quad (198)$$

$$(C_t)^2 - ((C_t - A_t) * (C_t - \text{Anti } A_t)) = (C_t)^2 \quad (199)$$

$$(C_t)^2 - ((C_t - A_t) * (C_t - (\text{Anti } A_t))) = (C_t)^2 \quad (200)$$

**Q. e. d.**

Set  $(C_t=1)^2 = 1^2$ . The law of the excluded middle as one of the basic laws of nature and thus of classical logic too is based on the identity law and can be derived from the same. The identity, the equivalence of

$$(A_t \vee (\text{Anti } A_t)) = 1 = C_t - ((C_t - A_t) * (C_t - (\text{Anti } A_t)))$$

is proofed as true (Barukčić 2006c).

**Law of the excluded middle.****Let**

$A_t$  denote something that at the (space)time  $t$ ,  
 Anti  $A_t$  denote (logical) negation of  $A_t$  that at the (space)time  $t$ ,  
 $C_t$  denote something other at the (space)time  $t$ . Let  
 $t$  denote the (space)time  $t$ ,  
 then

$$(C_t)^2 - ((C_t)^2 / 4) \geq (3/4) * (C_t)^2.$$

**Proof.**

Equation

$$A_t = A_t \quad (201)$$

$$A_t - A_t = 0 \quad (202)$$

$$C_t + A_t - A_t = C_t \quad (203)$$

$$A_t + C_t - A_t = C_t \quad (204)$$

Recall, that **Anti  $A_t = C_t - A_t$**  thus we obtain

$$A_t + (\text{Anti } A_t) = C_t \quad (205)$$

$$(C_t) * (A_t) + (C_t) * (\text{Anti } A_t) = (C_t)^2 \quad (206)$$

$$(C_t) * (A_t) + (C_t) * (\text{Anti } A_t) - 0 = (C_t)^2 \quad (207)$$

According to the law of contradiction, it is true that

$$(A_t * (\text{Anti } A_t)) = 0. \text{ Thus we obtain}$$

$$(C_t) * (A_t) + (C_t) * (\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (208)$$

$$0 + (C_t) * (A_t) + (C_t) * (\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (209)$$

$$(C_t)^2 - (C_t)^2 + (C_t) * (A_t) + (C_t) * (\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (210)$$

$$(C_t)^2 - ((C_t)^2 - (C_t) * (A_t) - (C_t) * (\text{Anti } A_t) + (A_t * (\text{Anti } A_t))) = (C_t)^2 \quad (211)$$

$$(C_t)^2 - ((C_t - A_t) * (C_t - \text{Anti } A_t)) = (C_t)^2 \quad (212)$$

$$(C_t)^2 - ((C_t - A_t) * (C_t - \text{Anti } A_t)) = (C_t)^2 \quad (213)$$

$$(C_t)^2 - ((\text{Anti } A_t) * (C_t - \text{Anti } A_t)) = (C_t)^2 \quad (214)$$

$$(C_t)^2 - ((\text{Anti } A_t) * (A_t)) = (C_t)^2 \quad (215)$$

According to the general contradiction law (Barukčić 2006e), it is true that  $((\text{Anti } A_t) * (A_t)) \leq ((C_t)^2 / 4)$ . We obtain the next equation according to Barukčić (Barukčić 2006a, pp. 83-86).

$$(C_t)^2 - ((C_t)^2 / 4) \geq (3/4) * (C_t)^2 \quad (216)$$

**Q. e. d.**

## 2.2. Tensors

William Rowan **Hamilton** introduced the word tensor in 1846. Gregorio **Ricci-Curbastro** developed the notation tensor around 1890. The notation tensor was made accessible to mathematicians by Tullio **Levi-Civita** in 1900.

A **tensor** is an mathematical object **in and of itself**, a tensor is independent of any chosen frame of reference, a tensor is independent of human mind and consciousness. Scalars have no indices, vectors have exactly one index and matrices have exactly two indices. Tensors are generalisations of scalars, vectors and matrices to an arbitrary number of indices. Tensors with upper indices (so-called "contravariant" tensors) and with lower indices (so-called "covariant" tensors) are distinguished. The distinction between contravariant and covariant indices is made for general tensors although the two are equivalent for tensors in three-dimensional Euclidean space known as Cartesian tensors. A tensor may be of mixed type too, tensors obey certain transformation rules. A tensor can be defined with respect to any system of coordinates by a number of functions of the co-ordinates. These functions of the co-ordinates can be called the components of the tensor. The components of a tensor can be calculated for a new system of coordinates according to certain rules, if the components of a tensor for the original system of co-ordinates are known and if the transformation connecting the both systems is known too. The equations of transformation of the components of tensors are homogeneous and linear. Consequently, if all the components of a tensor in the original system vanish, all the components in the new system vanish too. Tensors are more or less functions of space and time. There are a set of tensor rules. Following these tensor rules, it is possible to build tensor expressions that will preserve tensor properties of co-ordinate transformations. A **tensor term**  $A_i B^j C_k^l D_{mn} \dots$  is a product of tensors  $A_i$ ,  $B^j$ ,  $C_k^l$  and  $D_{mn} \dots$ . A **tensor expression** is a sum of tensor terms  $A_i B^j + C_k^l D_{mn} \dots$ . The terms in the tensor expression may come with plus or minus sign. Addition, subtraction and multiplication are the only allowed algebraic operations in tensor expressions, divisions are allowed for constants. The metrical properties of space-time are more or less defined by the gravitational field. Gravitation, the metrical properties of space-time or a laws of nature as such are thus generally covariant if they can be expressed by equating all the components of a tensor to zero. With this in view, it is possible formulating generally covariant laws by examining the laws of the formation of tensors.

It is not my purpose in this discussion to represent an introduction into the general theory of tensors that is as simple and logical as possible. My main object is to give a quick introduction into this theory in such a way that the reader can follow the next chapters in this publication and to be able to find a path to logic and thus to probability theory to.

Tensors will provide us a natural mathematical framework for formulating and solving problems of logic, probability theory, quantum theory and general relativity with one and the same mathematical framework.

Closely related to tensors is Einstein's general relativity (1916). **Einstein's** theory of general relativity (1916) is formulated completely in the language of tensors. The following is based on Einstein's publication (Einstein, 1916).

### 2.2.1 Four-vectors

#### 2.2.1.1 Contravariant Four-vectors

Let a linear element be defined by the four components  $dx_\nu$ . The law of transformation is then expressed by the equation

$$dx'_{\sigma} = \left( \sum_{\nu} \frac{(\partial x'_{\sigma})}{(\partial x_{\nu})} dx_{\nu} \right) \quad (217)$$

The  $dx'_{\sigma}$  are expressed as homogeneous and linear functions of the  $dx_{\nu}$ . These co-ordinate differentials are something like the components of a tensor of the particular kind. Let us call this object a contravariant four-vector. In so far, if something is defined relatively to the system of co-ordinates by four quantities  $A^{\nu}$  and if it is transformed by the same law

$$A'^{\sigma} = \left( \sum_{\nu} \frac{(\partial x'_{\sigma})}{(\partial x_{\nu})} A^{\nu} \right) \quad (218)$$

it is also called a contravariant four-vector. According to the rule for the addition and subtraction of tensors it follows at once that the sums  $A^{\sigma} \pm B^{\sigma}$  are also components of a four-vector, if  $A^{\sigma}$  and  $B^{\sigma}$  are such.

### 2.2.1.2 Covariant Four-vectors

Let us assume that for any arbitrary choice of the contravariant four-vector  $B^{\nu}$

$$\left( \sum_{\nu} A_{\nu} B^{\nu} \right) = \text{Invariant} \quad (219)$$

In this case, the four quantities  $A_{\nu}$  are called the components of a covariant four-vector. Let us replace  $B^{\nu}$  on the right-hand side of the equation

$$\left( \sum_{\sigma} A'_{\sigma} B'^{\sigma} \right) = \left( \sum_{\nu} A_{\nu} B^{\nu} \right) \quad (220)$$

by an expression which is resulting from the inversion of (218),

$$\left( \sum_{\sigma} \frac{(\partial x_{\nu})}{(\partial x'_{\sigma})} B'^{\sigma} \right) \quad (221)$$

thus we obtain

$$\left( \sum_{\sigma} B'^{\sigma} \right) * \left( \sum_{\nu} \frac{(\partial x_{\nu})}{(\partial x'_{\sigma})} A_{\nu} \right) = \sum_{\sigma} B'^{\sigma} A'_{\sigma} \quad (222)$$

This equation is true for arbitrary values of the  $B'^{\sigma}$ , thus we obtain the law of the transformation of a covariant four-vector as

$$A'_{\sigma} = \left( \sum_{\nu} \frac{(\partial x_{\nu})}{(\partial x'_{\sigma})} A_{\nu} \right) \quad (223)$$

The covariant and contravariant four-vectors can be distinguished by the law of transformation. According to Ricci and Levi-Civita, we denote the covariant (lower indices) character by placing the index below, the contravariant (upper indices) character by placing the index above.

## 2.2.2 Tensors of the Second and Higher Ranks

### 2.2.2.1 Contravariant Tensors

Let  $A^\mu$  and  $B^\nu$  denote the components of two contravariant four-vectors

$$A^{\mu\nu} = A^\mu B^\nu. \quad (224)$$

Thus,  $A^{\mu\nu}$  satisfies the following law of transformation

$$A'^{\sigma\tau} = \left( \frac{\partial x'_\sigma}{\partial x_\mu} \right) * \left( \frac{\partial x'_\tau}{\partial x_\nu} \right) A^{\mu\nu} \quad (225)$$

Something satisfying the law of transformation (225) and described relatively to any system of reference by sixteen quantities is called a contravariant tensor of the second rank.

### 2.2.2.2 Contravariant Tensors of Any Rank

A contravariant tensors (upper indices) of the third and higher ranks can be defined with  $4^3$  components, and so on.

### 2.2.2.3 Covariant Tensors

Let  $A_\mu$  and  $B_\nu$  denote the components of two covariant four-vectors

$$A_{\mu\nu} = A_\mu B_\nu. \quad (226)$$

Thus,  $A_{\mu\nu}$  satisfies the following law of transformation

$$A'_{\sigma\tau} = \left( \frac{\partial x_\mu}{\partial x'_\sigma} \right) * \left( \frac{\partial x_\nu}{\partial x'_\tau} \right) A_{\mu\nu} \quad (227)$$

This law of transformation (217) defines the covariant tensor of the second rank.

### 2.2.2.4 Mixed Tensors

A mixed tensor is a tensor of the second rank of the type which is covariant with respect to the index  $\mu$ , and contravariant with respect to the index  $\nu$ . This mixed tensor can be defined as

$$A^\nu_\mu = A_\mu B^\nu. \quad (228)$$

The law of transformation of the mixed tensor is

$$A'_{\sigma}{}^{\tau} = \left( \frac{\partial x'_{\tau}}{\partial x_{\nu}} \right) * \left( \frac{\partial x_{\mu}}{\partial x'_{\sigma}} \right) A^{\nu}_{\mu} \quad (229)$$

### 2.2.2.5 Symmetrical Tensors

A contravariant or covariant tensor of the second or higher rank is said to be symmetrical

$$A_{\mu\nu} = A_{\nu\mu} \quad (230)$$

or respectively,

$$A^{\mu\nu} = A^{\nu\mu} . \quad (231)$$

### 2.2.2.6 Antisymmetrical Tensors

A contravariant or a covariant tensor of the second, third, or fourth rank is said to be antisymmetrical if

$$A^{\mu\nu} = -A^{\nu\mu} \quad (232)$$

or respectively,

$$A_{\mu\nu} = -A_{\nu\mu} \quad (233)$$

or

$$A^{\mu\nu} = -A^{\nu\mu} . \quad (234)$$

That is to say, the two components of an **antisymmetrical tensor** are obtained by an interchange of the two indices and by an opposite sign. In a continuum of four dimensions there seems to be that there are no antisymmetrical tensors of higher rank than the fourth.

## 2.2.3 Multiplication of Tensors

### 2.2.3.1 Outer Multiplication of Tensors

The components of a tensor of rank  $n + m$  can be obtain from the components of a tensor of rank  $n$  and from the components of a tensor of rank  $m$  by multiplying each component of the one tensor by each component of the other. Examples.

$$C_{\mu\nu\sigma} = A_{\nu\mu} B_{\sigma} \quad (235)$$

$$C^{\mu\nu\sigma\tau} = A^{\nu\mu} B^{\sigma\tau} \quad (236)$$

$$C^{\mu\nu}{}_{\sigma\tau} = A^{\nu\mu} B_{\sigma\tau} \quad (237)$$

### 2.2.3.2 "Contraction" of a Mixed Tensor

The rank of mixed tensors can be decreased to a rank that is less by two, by contraction that is by equating an index of contravariant with one of covariant character, and summing with respect to this index. The result of contraction possesses the tensor character.

### 2.2.3.3 Inner und Mixed Multiplication of Tensors

The inner und mixed multiplication of tensors consist at the end in a combination of contraction with outer multiplication.



#### 2.2.4 Addition of Tensors

Two tensors A and B with the same rank and the same contravariant and covariant indices can be added in the obvious way.

$$C_{\mu\nu} = A_{\mu\nu} + B_{\mu\nu} \quad (238)$$

$$C^{\mu\nu} = A^{\mu\nu} + B^{\mu\nu} \quad (239)$$

$$C^{\mu}_{\nu} = A^{\mu}_{\nu} + B^{\mu}_{\nu} \quad (240)$$

#### 2.2.4 Anti-Tensor

As mentioned above, two tensors A and B with the same rank and the same contravariant and covariant indices can be added in the obvious way. Let us assume that there is no third between two tensors A and Anti A. On this view, we define an **Anti tensor** in the following way.

$$C_{\mu\nu} = A_{\mu\nu} + \text{Anti } A_{\mu\nu} \quad (241)$$

$$C^{\mu\nu} = A^{\mu\nu} + \text{Anti } A^{\mu\nu} \quad (242)$$

$$C^{\mu}_{\nu} = A^{\mu}_{\nu} + \text{Anti } A^{\mu}_{\nu} \quad (243)$$

An **Anti tensor** should be distinguished from an **Anti symmetrical tensor**, both are not the same.

$$\text{Set } C_{\mu\nu} = 0. \quad (244)$$

$$C_{\mu\nu} = 0 = A_{\mu\nu} + \text{Anti } A_{\mu\nu} \quad (245)$$

$$+A_{\mu\nu} = - \text{Anti } A_{\mu\nu} \quad (245)$$

$$-A_{\mu\nu} = + \text{Anti } A_{\mu\nu} \quad (246)$$

$$\text{Set } C^{\mu\nu} = 0. \quad (247)$$

$$C^{\mu\nu} = 0 = A^{\mu\nu} + \text{Anti } A^{\mu\nu} \quad (248)$$

$$+A^{\mu\nu} = - \text{Anti } A^{\mu\nu} \quad (249)$$

$$-A^{\mu\nu} = + \text{Anti } A^{\mu\nu} \quad (250)$$

$$\text{Set } C^{\mu}_{\nu} = 0. \quad (251)$$

$$C^{\mu}_{\nu} = 0 = A^{\mu}_{\nu} + \text{Anti } A^{\mu}_{\nu} \quad (252)$$

$$+A^{\mu}_{\nu} = - \text{Anti } A^{\mu}_{\nu} \quad (253)$$

$$-A^{\mu}_{\nu} = + \text{Anti } A^{\mu}_{\nu} \quad (254)$$

### 2.2.4 Division of Tensors

Tensor algebra appears to me is not that much developed. To allow something like division operations on tensors, we must go an special way. Let us divide X by X that is to say  $X / X$ . The result should be something like 1 or  $X / X = 1$  as long as  $X \neq 0$ . This division can be expressed in another way too. Let us perform an operation on a tenor X that way, that  $X * d(X) = 1$ , then we have done equally a division operation too. The problem is, is there an operation like the term  $* d(X)$ .

Thus, let A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

Let  $d(A)$  denote something like a law of transformation of the (covariant, contravariant, mixed, ...) tensor A or something like another tensor. Whatever  $d(A)$  may be,  $d(A)$  must obey some special rules. It has to be true that

$$A * d(A) = 1. \quad (255)$$

Such an  $d(A)$  would enable us to perform division operations on tensors.

### 2.2.5 Necessity and randomness of a tensor

Let A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

Let  $n(A)$  denote the law of transformation of the (covariant, contravariant, mixed, ...) tensor A or another tensor or something else. Whatever  $n(A)$  may be,  $n(A)$  must obey some special rules.

Let B denote a another (covariant, contravariant, mixed, ...) tensor B (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

Let  $n(B)$  denote the law of transformation of the (covariant, contravariant, mixed, ...) tensor B or another tensor or something else. Whatever  $n(A)$  may be,  $n(B)$  must obey some special rules.

Let C denote a another (covariant, contravariant, mixed, ...) tensor C (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

$$A + B = C. \quad (256)$$

There is no third between A and B, tertium non datur!

$$A = n(A) * C. \quad (257)$$

$$B = (1 - n(A)) * C = n(B) * C. \quad (258)$$

$$n(A) + n(B) = 1. \quad (259)$$

n denotes something like the necessity of a tensor.

### 3. Results

#### 3.1. Logic

##### 3.1.1. The constancy of the law of identity ( in vacuo )

Let A denote something existing independently of human mind and consciousness, a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc.

As long as  $A = A$  (Barukčić 2006a, pp. 55-60, pp. 44-46), A is only itself, A is only simple equality with itself, A is at the end only self-related and equally unrelated to an other, A is distinct from any relation to an other, any relation to an other is removed, any relation to an other has vanished. Consequently, A contains nothing other but only itself, A is thus just the 'pure' A.

In this way, A is somehow the absence of any other determination, A is in its own self only itself and nothing else and identical only with itself.

$$A = A. \quad (260)$$

Consequently, A is just itself and not equally the transition into its opposite, A is not opposed to an other, A is not confronted by its other, A is not against an other, the negative of A is not as necessary as A itself. A is thus without any opposition or contradiction.

A is identical only with itself and has passed over into pure equality with itself, it is just the "pure" A. Only it is equally true, that A is the positive A.

$$+A = +A \quad (261)$$

Even if  $A = A$  it is equally not a negative A it is a positive A. In so far, in the pure positive A, the relation to its other is contained. We obtain the next equation.

$$+A - A = 0 \quad (262)$$

The situation doesn't change if we regard the negative A.

$$-A = -A \quad (263)$$

Even if  $-A = -A$  it is equally not a positive A it is a negative A. In so far, in the pure negative A, the relation to its other is contained. We obtain the next equation.

$$+A - A = 0 \quad (264)$$

In zero, the positive and negative are united.

**Theorem 6.** The identity and the difference between  $X_t$  and  $\text{Anti } X_t$ .

**Let**

$X_t$  denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object,  $\sigma(\dots)$  etc. at the (space) time  $t$ ,

$X_t$  be opposed to  $(\text{Anti } X)_t$ ,

$\text{Anti } X_t$  denote the other side of  $X_t$ , the opposite of  $X_t$ , the complementary of  $X_t$ , the hidden part of  $X_t$  (Barukčić 2006b), a random variable, at the (space) time  $t$ ,

$\text{Anti } X_t$  be opposed to  $X_t$ ,

$t$  denote the (space) time,

$C_t$  denote the unity of  $X_t$  and  $(\text{Anti } X)_t$ .

Let us respect **the law of the excluded middle**. That is to say, there is no third between  $X_t$  and  $\text{Anti } X_t$  at the same (space) time  $t$ . In so far, we obtain equally

$$\begin{aligned} X_t + (\text{Anti } X)_t &= C_t \\ \text{or } (\text{Anti } X)_t &= C_t - X_t. \end{aligned}$$

Further, let us assume that  $C_t > 0$ . Let

$(\text{Anti } X)_t = (X)_t$  denote our assumption that  $(\text{Anti } X)_t$  is not dominant over  $(X)_t$  and vice versa. Equally  $(X)_t$  is not dominant over  $(\text{Anti } X)_t$ ,

**then**

$$X_t * (\text{Anti } X)_t = C_t^2 / 4.$$

**Proof.**

$$(\text{Anti } X)_t = X_t \quad (265)$$

$$(\text{Anti } X)_t + (\text{Anti } X)_t = (\text{Anti } X)_t + X_t \quad (266)$$

$$2 * (\text{Anti } X)_t = (C_t) \quad (267)$$

$$(\text{Anti } X)_t = (C_t) / 2 \quad (268)$$

$$(\text{Anti } X)_t - ((C_t) / 2) = 0 \quad (269)$$

$$((\text{Anti } X)_t - ((C_t) / 2))^2 = 0^2 \quad (270)$$

$$((\text{Anti } X)_t)^2 - ((\text{Anti } X)_t * (C_t)) + ((C_t) / 2)^2 = 0^2 \quad (271)$$

$$((\text{Anti } X)_t)^2 - ((\text{Anti } X)_t * (C_t)) = -((C_t) / 2)^2 \quad (272)$$

$$-((\text{Anti } X)_t)^2 + ((\text{Anti } X)_t * (C_t)) = +((C_t) / 2)^2 \quad (273)$$

$$+((\text{Anti } X)_t * (C_t)) - ((\text{Anti } X)_t)^2 = +((C_t) / 2)^2 \quad (274)$$

$$(\text{Anti } X)_t * (C_t) - (\text{Anti } X)_t^2 = C_t^2 / 4 \quad (275)$$

$$(\text{Anti } X)_t * (C_t - (\text{Anti } X)_t) = C_t^2 / 4 \quad (276)$$

$$(C_t - X_t) * (C_t - (C_t - X_t)) = C_t^2 / 4 \quad (277)$$

$$(C_t - X_t) * (C_t - C_t + X_t) = C_t^2 / 4 \quad (278)$$

$$(C_t - X_t) * (0 + X_t) = C_t^2/4 \quad (279)$$

$$(C_t - X_t) * (C_t + X_t) = C_t^2/4 \quad (280)$$

$$X_t * (C_t - X_t) = C_t^2/4 \quad (281)$$

$$X_t * (\text{Anti } X)_t = C_t^2/4 \quad (282)$$

**Q. e. d.**

Anti  $X_t$  and  $X_t$  must not be equal to each other or symmetrical. The one can be dominant over the other. How can this be ruled out in the same relation? On the other hand, why should the one allow the other to be dominant over its own self?

**Theorem 7.**  $X_t$  is dominant over Anti  $X_t$ . The opposition between  $X_t$  and Anti  $X_t$ .

**Let**

$X_t$  denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object,  $\sigma(\dots)$  etc. at the (space) time  $t$ ,

$X_t$  be opposed to  $(\text{Anti } X)_t$ ,

Anti  $X_t$  denote the other side of  $X_t$ , the opposite of  $X_t$ , the complementary of  $X_t$ , the hidden part of  $X_t$ , a random variable, at the (space) time  $t$ ,

Anti  $X_t$  be opposed to  $X_t$ ,

$t$  denote the (space) time  $t$ ,

$C_t$  denote the unity of  $X_t$  and  $(\text{Anti } X)_t$ ,

us respect **the law of the excluded middle**. That is to say, there is no third between  $X_t$  and Anti  $X_t$  at the same (space) time  $t$ . In so far, we obtain equally

$$X_t + (\text{Anti } X)_t = C_t,$$

$$\text{or } (\text{Anti } X)_t = C_t - X_t.$$

Further, let us assume that  $C_t > 0$ . Let

$(X)_t \geq (\text{Anti } X)_t$  denote our assumption that  $(X)_t$  is **dominant** over  $(\text{Anti } X)_t$  or equally  $(\text{Anti } X)_t$  is not dominant over  $(X)_t$ ,

**then**

$$X_t * (\text{Anti } X)_t \leq C_t^2/4.$$

**Proof.**

$$X_t \geq (\text{Anti } X)_t \quad (283)$$

$$X_t + X_t \geq X_t + (\text{Anti } X)_t \quad (284)$$

$$2X_t \geq X_t + (\text{Anti } X)_t \quad (285)$$

$$2X_t \geq C_t \quad (286)$$

$$X_t \geq C_t/2 \quad (287)$$

$$(X_t/C_t) \geq 1/2 \quad (288)$$

$$(X_t/C_t) - (1/2) \geq 0 \quad (289)$$

$$((X_t/C_t) - 0.5)^2 \geq 0^2 \quad (290)$$

$$((X_t/C_t)^2 - (X_t/C_t) + (1/4)) \geq 0 \quad (291)$$

$$-(X_t/C_t)^2 + (X_t/C_t) - (1/4) \leq 0 \quad (292)$$

$$-(X_t/C_t)^2 + (X_t/C_t) \leq (1/4) \quad (293)$$

$$(X_t/C_t) - (X_t/C_t)^2 \leq (1/4) \quad (294)$$

$$(X_t/C_t) * (1 - (X_t/C_t)) \leq (1/4) \quad (295)$$

$$(X_t/C_t) * ((C_t/C_t) - (X_t/C_t)) \leq (1/4) \quad (296)$$

$$((X_t) * (C_t - X_t)) / (C_t * C_t) \leq (1/4) \quad (297)$$

$$((X_t) * (C_t - X_t)) \leq ((C_t * C_t) / 4) \quad (298)$$

$$X_t * (C_t - X_t) \leq C_t^2 / 4 \quad (299)$$

$$X_t * (\text{Anti } X)_t \leq C_t^2 / 4 \quad (300)$$

**Q. e. d.**

On the other hand, Anti  $X_t$  could equally be dominant over  $X_t$ . This is difficult to rule out in one and the same relation.

**Theorem 8.** Anti  $X_t$  is dominant over  $X_t$ . The opposition between  $X_t$  and Anti  $X_t$ .

**Let**

$X_t$  denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object,  $\sigma(\dots)$  etc. at the (space) time  $t$ ,

$X_t$  be opposed to  $(\text{Anti } X)_t$ ,

Anti  $X_t$  denote the other side of  $X_t$ , the opposite of  $X_t$ , the complementary of  $X_t$ , the hidden part of  $X_t$ , a random variable, at the (space) time  $t$ ,

Anti  $X_t$  be opposed to  $X_t$ ,

$t$  denote the (space) time  $t$ ,

$C_t$  denote the unity of  $X_t$  and  $(\text{Anti } X)_t$ ,

us respect **the law of the excluded middle**. That is to say, there is no third between  $X_t$  and Anti  $X_t$  at the same (space) time  $t$ . In so far, we obtain equally

$$X_t + (\text{Anti } X)_t = C_t$$

$$\text{or } (\text{Anti } X)_t = C_t - X_t.$$

Further, let us assume that  $C_t > 0$ . Let

$(\text{Anti } X)_t \geq (X)_t$  denote our assumption that  $(\text{Anti } X)_t$  is **dominant** over  $(X)_t$  or equally  $(X)_t$  is not dominant over  $(\text{Anti } X)_t$ ,

**then**

$$\mathbf{X}_t * (\mathbf{Anti X})_t \leq C_t^2 / 4.$$

**Proof.**

$$(\mathbf{Anti X})_t \geq \mathbf{X}_t \quad (301)$$

$$(\mathbf{Anti X})_t + (\mathbf{Anti X})_t \geq (\mathbf{Anti X})_t + \mathbf{X}_t \quad (302)$$

$$2 * (\mathbf{Anti X})_t \geq (C_t) \quad (303)$$

$$(\mathbf{Anti X})_t \geq (C_t) / 2 \quad (304)$$

$$(\mathbf{Anti X})_t \geq (C_t) / 2 \quad (305)$$

$$(\mathbf{Anti X})_t - ((C_t) / 2) \geq 0 \quad (306)$$

$$((\mathbf{Anti X})_t - ((C_t) / 2))^2 \geq 0^2 \quad (307)$$

$$((\mathbf{Anti X})_t)^2 - ((\mathbf{Anti X})_t * (C_t)) + ((C_t) / 2)^2 \geq 0^2 \quad (308)$$

$$((\mathbf{Anti X})_t)^2 - ((\mathbf{Anti X})_t * (C_t)) \geq -((C_t) / 2)^2 \quad (309)$$

$$-((\mathbf{Anti X})_t)^2 + ((\mathbf{Anti X})_t * (C_t)) \leq +((C_t) / 2)^2 \quad (310)$$

$$+((\mathbf{Anti X})_t * (C_t)) - ((\mathbf{Anti X})_t)^2 \leq +((C_t) / 2)^2 \quad (311)$$

$$(\mathbf{Anti X})_t * (C_t) - (\mathbf{Anti X})_t^2 \leq C_t^2 / 4 \quad (312)$$

$$(\mathbf{Anti X})_t * (C_t - (\mathbf{Anti X})_t) \leq C_t^2 / 4 \quad (313)$$

$$(C_t - X_t) * (C_t - (C_t - X_t)) \leq C_t^2 / 4 \quad (314)$$

$$(C_t - X_t) * (C_t - C_t + X_t) \leq C_t^2 / 4 \quad (315)$$

$$(C_t - X_t) * (0 + X_t) \leq C_t^2 / 4 \quad (316)$$

$$(C_t - X_t) * (+X_t) \leq C_t^2 / 4 \quad (317)$$

$$\mathbf{X}_t * (C_t - X_t) \leq C_t^2 / 4 \quad (318)$$

$$\mathbf{X}_t * (\mathbf{Anti X})_t \leq C_t^2 / 4. \quad (319)$$

**Q. e. d.**

In general, since (=) is part of ( $\leq$ ), we are allowed to state that the relationship between  $\mathbf{X}_t$  and  $(\mathbf{Anti X})_t$  is governed by the inequality

$$\mathbf{X}_t * (\mathbf{Anti X})_t \leq C_t^2 / 4,$$

which is termed as the **general contradiction law**.

The general contradiction law is very familiar with the logical contradiction law.

**Theorem 9.** The relation between the logical contradiction law and the general contradiction law.

**Let**

$X_t$  denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object,  $\sigma(\dots)$  etc. at the (space) time  $t$ , which can take only the values **either 0 or 1**,  
 $X_t$  be opposed to  $(\text{Anti } X)_t$ ,

$\text{Anti } X_t$  denote the other side of  $X_t$ , the opposite of  $X_t$ , the complementary of  $X_t$ , the hidden part of  $X_t$ , a random variable, at the (space) time  $t$ ,  
 $\text{Anti } X_t$  be opposed to  $X_t$ ,

$t$  denote the (space) time  $t$ ,

$C_t$  denote the unity of  $X_t$  and  $(\text{Anti } X)_t$ ,

us respect **the law of the excluded middle**. That is to say, there is no third between  $X_t$  and  $\text{Anti } X_t$  at the same (space) time  $t$ . In so far, we obtain equally

$$X_t + (\text{Anti } X)_t = C_t$$

$$\text{or } (\text{Anti } X)_t = C_t - X_t.$$

Further, let us assume that  $C_t \neq 0$ .

**Then**

$$X_t * (\text{Anti } X)_t \leq 1 / 4.$$

**Proof.**

$$X_t \quad (\text{Anti } X)_t \quad X_t \cap (\text{Anti } X)_t \quad C_t = X_t + (\text{Anti } X)_t \quad (C_t)^2 / 4 \quad X_t * (\text{Anti } X)_t \leq (C_t)^2 / 4 \quad \text{Eq.}$$

(1)	(2)	(3)	(4)	(5)	<b>(3) ≤ (5)</b>	
1	0	0	1	1 <sup>2</sup> /4	<b>True!</b>	(320)

0	1	0	1	1 <sup>2</sup> /4	<b>True!</b>	(321)
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**Q. e. d.**

The things don't change that much in the case of symmetry:  $-X_t - \text{Anti } X_t = -C_t$ . The general contradiction law is the general form of the logical contradiction law.



### 3.2. Tensors

#### Possibility

Actuality, possibility and necessity constitute the formal moments of movement, alteration or change. Possibility sublates itself in actuality, possibility passes over into actuality but equally, in actuality possibility returns back into itself. In so far, as a matter of fact, the hour of its own sublation is the hour of its own return back into itself, it is the transition of the one into an other, of a determinate into an indeterminate, and equally it is neither the one nor the other. The gradual passing away of the possibility into its own other, into actuality, its transition into actuality, finds their completion in necessity. Necessity is the unity and the struggle of possibility and actuality. But on the other hand, further and above all, possibility is possibility, it is thus the identity with itself and as such relationless, indeterminate, is not self-contradictory etc.

But possibility as only itself is opposed to actuality, is independent of actuality, lacks actuality, it is only a possible. The possible as independent from its own other simply unites with itself but it is equally determined as against its own other, as against actuality. This identity of the one and its own other, of both, is necessity. Possibility as identical with itself is necessity but equally actuality too. Possibility as qualitative otherness is opposed to actuality and equally the relation of each to the other and thus a contradiction.

A possible as a self-identical in general is thus an actual determined as only possible. But equally, possibility is determinate within itself and as against another and contains thus a negation. In general, possibility passes over into its own opposition, into actuality. Only, opposition is contradiction. In so far, in actuality possibility completes itself. Possibility contains thus two moments, itself and its other, possibility points to an other, to actuality in which it completes itself. X is possible means only that  $X = X$ . But the possible contains more than only the law of identity, another and its opposite are independently possible, possibility implies that the opposite of +X too is possible.  $+X = +X$  but independently it possible to that  $-X = -X$ . It is therefore that because  $+X = +X$ , therefore also  $-X = -X$ . In the possible +X the possible not +X or -X is also contained. This relation is the one which determines both as possible. Only, in a relation, in which the one possible also contains its own other, is contradicting itself and vanishes into actuality. Possibility as such is not yet all actuality. In so far, how far is possibility actuality?

#### Actuality

Possibility determined as separated from actuality, is contained in actuality, and the actual as such is at the end determined as only a possible. Actuality is thus the unity of itself and possibility, possibility contained in actuality is sublated possibility. In so far, actuality unites with possibility, something that is actual is equally possible too. Only, such an actuality is equally an actuality as against possibility. But first of all, since an actual and a possible are different, their relation consist in the randomness.

#### Necessity

The necessary is an actual, is something that under particular conditions and circumstances simply can no longer be otherwise, it must be itself. Something other cannot follow, something other cannot be otherwise. But an actual is determined as against a possible, necessity is thus equally relative necessity, because it has equally its starting point in the contingent. The conversion of necessity into its opposite, into contingency, the conversion of the one into its own other, has its actuality through an other, its opposite has penetrated into it. Contingency as the otherness of actuality and possibility vanishes into necessity and vice versa. The unity of necessity and contingency is thus the contradiction. An actual whose other or opposite independently is too is determined as random. Randomness is the unity of possibility and actuality, a unity in which each immediately turns into its opposite. A possible is thus an actual and equally a random and vice versa. The random is thus an actual as only a possible.

**Theorem 10.** The identity and the difference between  $A$  and  $\text{Anti } A$ .

**Let**

$A$  denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
 $A$  be opposed to  $(\text{Anti } A)$ ,

$B$  denote the other side of  $A$ , the opposite of  $A$ , the complementary of  $A$ , the hidden part of  $A$ , the  $\text{Anti } A$ ,  
 $B = \text{Anti } A$  be opposed to  $A$ ,

$C$  denote the unity of  $A$  and  $(\text{Anti } A)$ .

Let us respect **the law of the excluded middle**. That is to say, there is no third between  $A$  and  $\text{Anti } A$ . Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain

$$A + (\text{Anti } A) = C$$

or

$$A + B = C$$

or

$$B = (\text{Anti } A) = C - A.$$

Further, let

$n(A)$  denote the determinatedness of  $A$ , the necessity of  $A$ . Let us assume that the division by  $C$  is allowed. Let us define  $A = n(A) * C$ .

$n(B)$  denote the randomness, the indeterminatedness of  $A$ , the necessity of  $B$ . Let us assume that the division by  $C$  is allowed. Let us define  $B = n(B) * C$ . Let

$$n(A) + n(B) = 1. \text{ Let}$$

$\sigma(A)^2$  denote the variance of  $A$ . Let  $\sigma(A)^2 = n(A) * n(B) = n(A) * (1 - n(A)) \leq (1/4)$ . Let

$(\text{Anti } A) = (A)$  denote our assumption that  $(\text{Anti } A)$  is not dominant over  $(A)$  and vice versa. Equally  $(A)$  is not dominant over  $(\text{Anti } A)$ ,

**then**

$$A * (\text{Anti } A) = C^2 / 4.$$

**Proof.**

$$(\text{Anti } A) = A \tag{322}$$

$$(\text{Anti } A) + (\text{Anti } A) = (\text{Anti } A) + A \tag{323}$$

$$2 * (\text{Anti } A) = (C) \tag{324}$$

$$(\text{Anti } A) = (C) / 2 \tag{325}$$

$$(\text{Anti } A) - ((C) / 2) = 0 \tag{326}$$

$$((\text{Anti } A) - ((C) / 2))^2 = 0^2 \tag{327}$$

$$((\text{Anti A})^2 - ((\text{Anti A}) * (\text{C})) + ((\text{C})/2))^2 = 0^2 \quad (328)$$

$$((\text{Anti A})^2 - ((\text{Anti A}) * (\text{C})) = -((\text{C})/2))^2 \quad (329)$$

$$-((\text{Anti A})^2 + ((\text{Anti A}) * (\text{C})) = +((\text{C})/2))^2 \quad (330)$$

$$+((\text{Anti A}) * (\text{C})) - ((\text{Anti A})^2 = +((\text{C})/2))^2 \quad (331)$$

$$(\text{Anti A}) * (\text{C}) - (\text{Anti A})^2 = \text{C}^2/4 \quad (332)$$

$$(\text{Anti A}) * (\text{C} - (\text{Anti A})) = \text{C}^2/4 \quad (333)$$

$$(\text{C} - \text{A}) * (\text{C} - (\text{C} - \text{A})) = \text{C}^2/4 \quad (334)$$

$$(\text{C}_t - \text{A}) * (\text{C} - \text{C} + \text{A}) = \text{C}^2/4 \quad (335)$$

$$(\text{C} - \text{A}) * (0 + \text{A}) = \text{C}^2/4 \quad (336)$$

$$(\text{C} - \text{A}) * (\quad + \text{A}) = \text{C}^2/4 \quad (337)$$

$$\text{A} * (\text{C} - \text{A}) = \text{C}^2/4 \quad (338)$$

$$\text{A} * \text{B} = \text{C}^2/4 \quad (339)$$

$$\text{A} * (\text{Anti A}) = \text{C}^2/4 \quad (340)$$

**Q. e. d.**

Anti A and A can be equal to each other but this is not necessary. It is possible that the one is dominant over the other.

**Theorem 11.** A is dominant over Anti A. The opposition between A and Anti A.

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,

A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,

B = Anti A be opposed to A,

C denote the unity of A and (Anti A).

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain

$$\text{A} + (\text{Anti A}) = \text{C}$$

or

$$\text{A} + \text{B} = \text{C}$$

or

$$\text{B} = (\text{Anti A}) = \text{C} - \text{A}.$$

Further, let

$n(A)$  denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

$n(B)$  denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let

$$n(A) + n(B) = 1. \text{ Let}$$

$\sigma(A)^2$  denote the variance of A. Let  $\sigma(A)^2 = n(A)*n(B)=n(A)*(1-n(A)) \leq (1/4)$ . Let

$(A) \geq (\text{Anti } A)$  denote our assumption that (A) is dominant over (Anti A) and not vice versa. Equally (Anti A) is not dominant over (A) ,

then

$$A * (\text{Anti } A) \leq C^2 / 4.$$

**Proof.**

$$A \geq (\text{Anti } A) \tag{341}$$

$$A + A \geq A + (\text{Anti } A) \tag{342}$$

$$2A \geq A + (\text{Anti } A) \tag{343}$$

$$2A \geq C \tag{344}$$

$$A \geq C/2 \tag{345}$$

$$(A/C) \geq 1/2 \tag{346}$$

$$(A/C) - (1/2) \geq 0 \tag{347}$$

$$((A/C) - 0.5)^2 \geq 0^2 \tag{348}$$

$$((A/C)^2 - (A/C) + (1/4)) \geq 0 \tag{349}$$

$$-(A/C)^2 + (A/C) - (1/4) \leq 0 \tag{350}$$

$$-(A/C)^2 + (A/C) \leq (1/4) \tag{351}$$

$$(A/C) - (A/C)^2 \leq (1/4) \tag{352}$$

$$(A/C) * (1 - (A/C)) \leq (1/4) \tag{353}$$

$$(A/C) * ((C/C) - (A/C)) \leq (1/4) \tag{354}$$

$$((A) * (C - A)) / (C * C) \leq (1/4) \tag{355}$$

$$((A) * (C - A)) \leq ((C * C) / 4) \tag{356}$$

$$A * (C - A) \leq C^2 / 4 \tag{357}$$

$$A * B = C^2 / 4 \tag{358}$$

$$A * (\text{Anti } A) \leq C^2 / 4 \tag{359}$$

**Q. e. d.**

On the other hand, Anti A could equally be dominant over A . Thus, we obtain the next theorem.

**Theorem 12.** Anti A is dominant over A . The opposition between A and Anti A .

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A . Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain

$$A + (\text{Anti } A) = C$$

or

$$A + B = C$$

or

$$B = (\text{Anti } A) = C - A.$$

Further, let

n(A) denote the determinedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let

$$n(A) + n(B) = 1. \text{ Let}$$

$\sigma(A)^2$  denote the variance of A. Let  $\sigma(A)^2 = n(A)*n(B)=n(A)*(1- n(A)) \leq (1/4)$ . Let

$(\text{Anti } A) \geq (A)$  denote our assumption that (Anti A) is dominant over (A) and not vice versa. Equally (A) is not dominant over (Anti A) ,

**then**

$$A * (\text{Anti } A) \leq C^2 / 4. \quad (360)$$

**Proof.**

$$(\text{Anti } A) \geq A \quad (361)$$

$$(\text{Anti } A) + (\text{Anti } A) \geq (\text{Anti } A) + A \quad (362)$$

$$2 * (\text{Anti } A) \geq (C) \quad (363)$$

$$(\text{Anti } A) \geq (C) / 2 \quad (364)$$

$$(\text{Anti } A) \geq (C) / 2 \quad (365)$$

$$(\text{Anti } A) - ((C)/2) \geq 0 \quad (366)$$

$$((\text{Anti } A) - ((C)/2))^2 \geq 0^2 \quad (367)$$

$$((\text{Anti } A))^2 - ((\text{Anti } A) * (C)) + ((C)/2)^2 \geq 0^2 \quad (368)$$

$$((\text{Anti } A))^2 - ((\text{Anti } A) * (C)) \geq -((C)/2)^2 \quad (369)$$

$$-((\text{Anti } A))^2 + ((\text{Anti } A) * (C)) \leq +((C)/2)^2 \quad (370)$$

$$+((\text{Anti } A) * (C)) - ((\text{Anti } A))^2 \leq +((C)/2)^2 \quad (371)$$

$$(\text{Anti } A) * (C) - (\text{Anti } A)^2 \leq C^2/4 \quad (372)$$

$$(\text{Anti } A) * (C - (\text{Anti } A)) \leq C^2/4 \quad (373)$$

$$(C - A) * (C - (C - A)) \leq C^2/4 \quad (374)$$

$$(C - A) * (C - C + A) \leq C^2/4 \quad (375)$$

$$(C - A) * (0 + A) \leq C^2/4 \quad (376)$$

$$(C - A) * (+A) \leq C^2/4 \quad (377)$$

$$A * (C - A) \leq C^2/4 \quad (378)$$

$$A * (\text{Anti } A) \leq C^2/4. \quad (379)$$

**Q. e. d.**

Set  $((-A - B) = -C) < 0$ , the situation doesn't change at all. It is known, that  $(=)$  is part of  $(\leq)$ . In so far, the relationship between **A** and  $(\text{Anti } A)$  expressed in the language of tensors is governed too by the same inequality

$$A * (\text{Anti } A) \leq C_t^2 / 4,$$

which was already termed as the general contradiction law. Note, our understanding of an **anti tensor** is not identical with the term **antisymmetrical tensor**. An anti tensor **A** in our understanding is defined as

$$\text{Anti } A = C - A$$

while an antisymmetrical tensor is defined something like  $-A$ .

### 3.3. Dialectical tensor logic

The following definitions are based under **the assumption of independence**.

**Definition 3.3.1** Conjugation: tensor A is conjugated with the tensor E .

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or

$$B = (\text{Anti } A) = C - A.$$

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  
 $n(A) + n(B) = 1$ .

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E ),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E ) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

n(A ∩ E) denote the determinatedness, the necessity of conjugation between A and E,

then in the case of independence,

$$n(A \cap E) = ((A * E) / (C * G)) = n(A) * n(E)$$

$$n(A \cap E \cap \dots \cap Z) = n(A) * n(E) * \dots * n(Z).$$

**Definition 3.3.2 Exclusion:** Anti conjugation: tensor A excludes tensor E and vice versa.

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or

$$B = (\text{Anti } A) = C - A.$$

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  
 $n(A) + n(B) = 1$ .

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

$\cap$  denote natural process of conjugation of tensors,

n(A  $\cap$  E) denote the determinatedness, the necessity of conjugation of tensor A and tensor E,

| denote natural process of exclusion,

n(A | E) denote the determinatedness, the necessity of exclusion of tensor A by tensor E and vice versa, then

$$n(A | E) = 1 - n(A \cap E) = 1 - ((A * E) / (C * G)) = 1 - (n(A) * n(E)).$$

$$n(A | E | \dots | Z) = 1 - ((1 - (1 - (n(A)))) * (1 - (1 - n(E)))) * \dots * (1 - (1 - n(Z)))) .$$

$$n(A | E | \dots | Z) + n(A \cap E \cap \dots \cap Z) = 1.$$



**Definition 3.3.3** Disjunction: Tensor A or tensor E .**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or

$$B = (\text{Anti } A) = C - A.$$

**Let**

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  
 $n(A) + n(B) = 1$ .

**Let**

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E ),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E ) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

n(A  $\cup$  E ...) denote the determinatedness, the necessity of disjunction of tensor A and tensor E,  
then

$$n(A \cup E) = 1 - ((1 - n(A)) * (1 - n(E)))$$

$$n(A \cup E \cup \dots \cup Z) = 1 - ((1 - n(A)) * (1 - n(E)) * \dots * (1 - n(Z))).$$

**Definition 3.3.4 Rejection:** Anti disjunction: **Neither** tensor A **nor** tensor E.

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or

$$B = (\text{Anti } A) = C - A. \text{ Let}$$

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  
 $n(A) + n(B) = 1$ .

**Let**

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E ),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E ) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

$\cup$  denote natural process of disjunction of tensors,

n( A  $\cup$  E ... ) denote the determinatedness, the necessity of disjunction of tensor A and tensor E,

$\downarrow$  denote natural process of rejection of tensors,

n( A  $\downarrow$  E  $\downarrow$  ... ) denote the determinatedness, the necessity of rejection of tensor A and tensor E,

then

$$n(A \downarrow E) = ((1 - n(A)) * (1 - n(E)))$$

$$n(A \downarrow E \downarrow \dots \downarrow Z) = ((1 - n(A)) * (1 - n(E)) * \dots * (1 - n(Z)))$$

$$n(A \downarrow E \downarrow \dots \downarrow Z) + n(A \cup E \cup \dots \cup Z) = 1.$$

**Definition 3.3.5** Identity: The identity of tensor A and tensor E .

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or  $B = (\text{Anti } A) = C - A$ .

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  $n(A) + n(B) = 1$ .

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E ),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E ) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

$\leftrightarrow$  denote the natural process of identity,

n( A  $\leftrightarrow$  E ) denote the determinatedness, the necessity of identity of tensor A and tensor E,

then

$$n( A \leftrightarrow E ) = (1 - ( (1 - n(A)) * (1 - (1 - n(E))) ) * (1 - ( (1 - n(E)) * (1 - (1 - n(A))) ) ) )$$

**Definition 3.3.6 Opposition:** Anti identity: **Either** tensor A **or** tensor E.

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,

$B = \text{Anti } A$  be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  **or**  $(A + B = C)$  **or**

$$B = (\text{Anti } A) = C - A.$$

Let

$n(A)$  denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

$n(B)$  denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,

$F = \text{Anti } E$  be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  **or**  $E + F = G$ ,

$n(E)$  denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

$\leftrightarrow$  denote the natural process of identity,

$n(A \leftrightarrow E)$  denote the determinatedness, the necessity of identity of tensor A and tensor E,

$\rhd \lleftarrow$  denote the natural process of opposition,

$n(A \rhd \lleftarrow E)$  denote the determinatedness, the necessity of opposition between tensor A and tensor E,

then

$$n(A \rhd \lleftarrow E) = 1 - ((1 - ((1 - n(A)) * n(E))) * (1 - (n(A) * (1 - n(E))))).$$

$$n(A \rhd \lleftarrow E) + n(A \leftrightarrow E) = 1.$$

**Definition 3.3.7 Conditio-sine-qua non: Without tensor A no tensor E .**

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or  $B = (\text{Anti } A) = C - A$ .

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  $n(A) + n(B) = 1$ .

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E ),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E ) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

← denote the natural process called conditio-sine-qua non,

n(A ← E) denote the determinatedness, the necessity of without tensor A no tensor E,

then

$$n(A \leftarrow E) = ( 1 - ( ( 1 - n(A)) * (1 - (1 - n(E))) ) ).$$

**Definition 3.3.8 Anti conditio-sine-qua non: Not without tensor A no tensor E .**

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A ),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A ) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or  $B = (\text{Anti } A) = C - A$ .

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  $n(A) + n(B) = 1$ .

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E ),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E ) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

$\leftarrow$  denote the natural process called conditio-sine-qua non,

n(A  $\leftarrow$  E ) denote the determinatedness, the necessity of without tensor A no tensor E,

$\text{---} \leftarrow$  denote the natural process called anti-conditio-sine-qua non,

n(A  $\text{---} \leftarrow$  E ) denote the determinatedness, the necessity of anti-conditio-sine-qua non between tensor A and tensor E,

then

$$n(A \text{---} \leftarrow E) = (n(E) * (1 - n(A)))$$

$$n(A \leftarrow E) + n(A \text{---} \leftarrow E) = 1.$$

**Definition 3.3.9 Conditio per quam: When tensor A then tensor E.**

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,  
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or  $B = (\text{Anti } A) = C - A$ .

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let  $n(A) + n(B) = 1$ .

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,  
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

n(E) denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

→ denote the natural process of conditio per quam,

n(A → E) denote the determinatedness, the necessity of **when tensor A then tensor E**,

then

$$n(A \rightarrow E) = (1 - ((1 - (1 - n(A))) * (1 - n(E))))$$

**Definition 3.3.10 Anti conditio per quam: Not when tensor A then tensor E.**

**Let**

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,

$B = \text{Anti } A$  be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $A + (\text{Anti } A) = C$  or  $(A + B = C)$  or

$$B = (\text{Anti } A) = C - A.$$

Let

$n(A)$  denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define  $A = n(A) * C$ .

$n(B)$  denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define  $B = n(B) * C$ . Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,  
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,

$F = \text{Anti } E$  be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain  $E + (\text{Anti } E) = G$  or  $E + F = G$ ,

$n(E)$  denote the determinatedness of E, the necessity of E. Let us define  $E = n(E) * G$ .

$\rightarrow$  denote the natural process of conditio per quam,

$n(A \rightarrow E)$  denote the determinatedness, the necessity of when tensor A then tensor E,

$\succ$  denote the natural process of anti- conditio per quam,

$n(A \succ E)$  denote the determinatedness, the necessity of conditio per quam between tensor A and tensor E,

then

$$n(A \succ E) = n(A) * (1 - n(E)).$$

$$n(A \rightarrow E) + n(A \succ E) = 1.$$

If  $(n(A \rightarrow E) * n(C | E)) = 1$  or if  $(n(A \rightarrow E) * n(C \succ E)) = 1$ , then tensor C can be used as a measure against tensor A, as a measure to neutralise the effect of tensor A on E.



### 3.4. Probability theory

The Poisson Distribution as a limiting case of the Binomial Distribution can be used in cases where the number of Bernoulli trials becomes very large and  $n$ , the necessity of an event, is very small. The Poisson Distribution, named after the French mathematician Siméon-Denis Poisson (1781-1840), is sometimes called the distribution of rare events and describes a wide range of phenomena. The probability  $p$  that there are exactly  $k$  occurrences out of  $N$  Bernoulli trials can be calculated.

$$p(X = k) = \frac{(N * n(Y))^k * (e^{-N * n(Y)})}{k!}$$

$$\text{for } k = 0, 1, 2, \dots, \quad 0 < \lambda = N * n(Y),$$

where

$N$  denote the number of Bernoulli trials,

$k$  denote the number of occurrences of a rare event,

$p(X = k)$  denote the probability that there are exactly  $k$  occurrences out of  $N$  Bernoulli trials,

$n(Y)$  denote **the necessity** of an event. Let us assume in this case that

$n(Y) = (n(A \leftarrow B) * n(B \rightarrow C))$ , where

$A$  denote a tensor  $A$ , ...

$B$  denote a tensor  $B$ , ...

$n(A \leftarrow B)$  denote the necessity of the relationship: without annihilation of the particle  $A$  no annihilation of the particle  $B$ ,

$C$  denote a tensor  $C$ , ...

$n(B \rightarrow C)$  denote the necessity of the relationship: when annihilation of the particle  $B$  then annihilation of the particle  $C$ .

#### 4. Discussion

This publication should be read with great care since it is only a trial to unify logic and probability using the language of tensors and depends upon some assumptions that must not hold true. The tensor algebra is not fully developed, the division of tensors is not satisfactory solved.

The attempt to unify quantum mechanics and general relativity could be successful if the same mathematical framework is used. Quantum theory is respecting classical logic and more or less based on probability theory. On the other hand, general relativity is based on tensors and geometry and thus on pure logic. In so far, it appears to be that the both have nothing in common.

Contrary to expectation, logic is that what both have in common, classical logic is the foundation for general relativity and equally for quantum mechanics too. The development of a unique mathematical framework for logic and probability theory that is based on tensors could enable us to develop one theory, the unified field theory, that describes both, quantum mechanics and general relativity, using the same fundamental equations.

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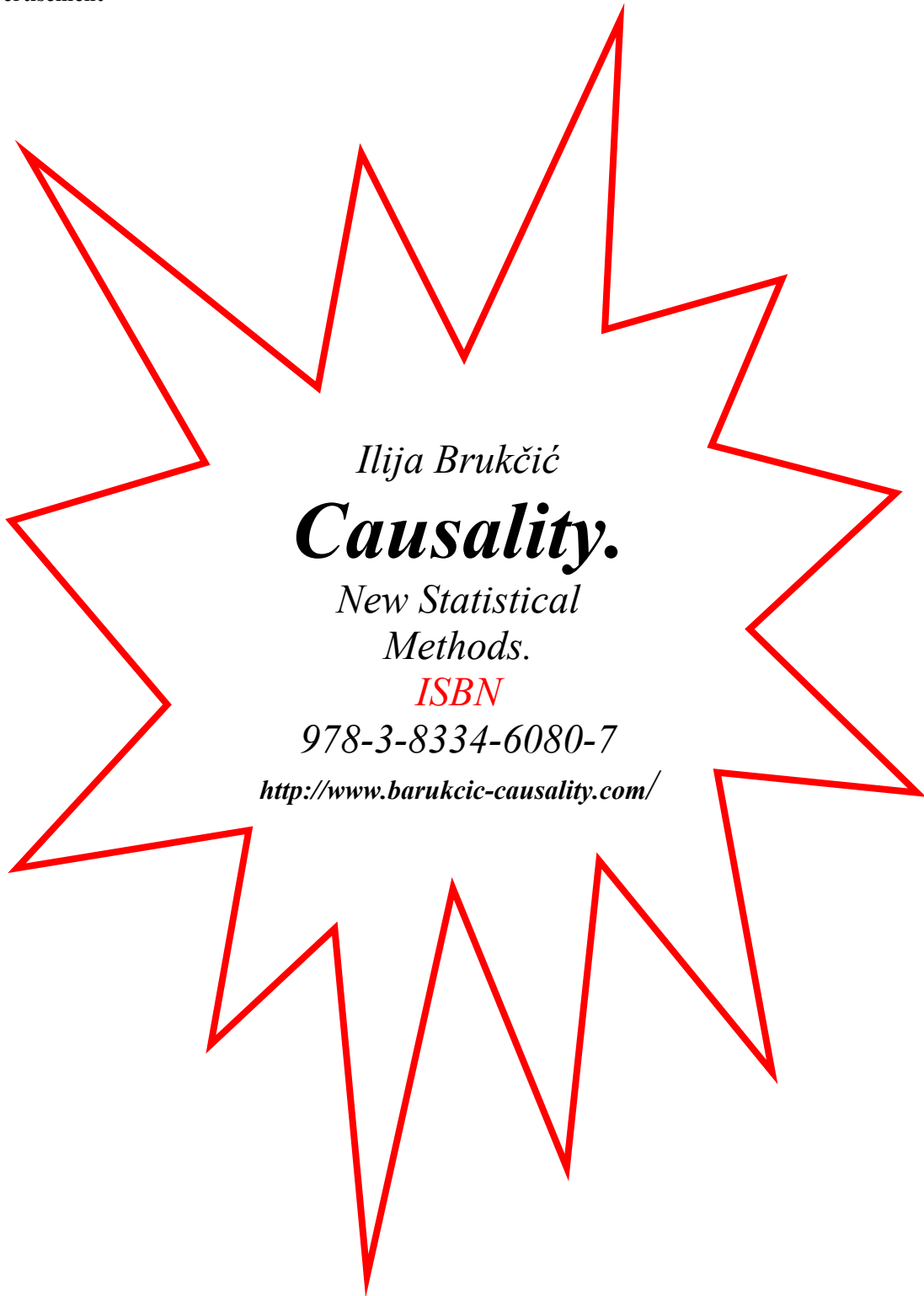
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## Epstein-Barr virus: a cause of human invasive breast cancer.

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### *Abstract*

**Background.** Breast cancer is a progressive and many times a deadly ending disease of the human breast. A or the cause of breast cancer is still unknown.

**Methods.** In this publication, we will reanalyse the study of Bonnet et al. (Bonnet 1999) using the conditio per quam relationship and the mathematical formula of the causal relationship *c*. All P values are one-sided; significance is indicated by a P value of less than 0.05.

**Results.** Using the conditio per quam relationship, it could be proofed that when infection of human breast with Epstein-Barr virus then development of human breast cancer. On the other hand, using the mathematical formula of the causal relationship *c*, it could be found that Epstein-Barr virus is at the same time a cause of human breast cancer.

**Conclusions.** When infection of the human breast with Epstein-Barr virus then development of human breast cancer. Epstein-Barr virus is a cause of breast cancer. A successful vaccine against Epstein-Barr virus will prevent from breast cancer.

*Key words:* Causal relationship, Epstein-Barr virus, Breast Cancer, Cause, Effect, Barukčić

### 1. Introduction

Breast cancer is a progressive disease that forms in tissues of the human breast usually in the glands that make milk and in the tubes that carry milk to the nipple. Male breast cancer is rare but breast cancer occurs in both men and women. Human breast cancer is the most common type of cancer among women in the United States. Based on estimates of The National Cancer Institute (Ries et al. 2006), about 12.7 percent of women born today in USA will be diagnosed with breast cancer at some time in their lives.

Scientists studying breast cancer found many different risk factors that may increase the chance of developing breast cancer. Age, family history, personal history of breast cancer, *BRCA1*, *BRCA2* and other gene changes, reproductive and menstrual history, drinking alcohol and many other too. Only, it is also important to keep in mind that a risk faktor is not identical with a cause. Most of the women who have some known risk factors do not get breast cancer.

Surgery, radiation therapy, chemotherapy, hormone therapy and others too are used to treat breast cancer. According to estimates of The American Cancer Society 40,970 women will die of cancer of the breast in 2006. Much is known about breast cancer but many unanswered questions remain.

**An exact exact cause or some exact causes of breast cancer still remain unknown.**

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## 2. Methods

### 2.1 Patients

Mathilde Bonnet et al. (Bonnet 1999) investigated the presence of the *Epstein-Barr virus (EBV)* genome, a ubiquitous human herpesvirus, in human tissues from 100 consecutive primary invasive human breast carcinomas, one of the most prevalent malignancies in Western countries, as well as 30 healthy tissues. Bonnet et al. detected the EBV genome by the polymerase chain reaction (PCR) in 51% of the tumours, whereas in 90% of the cases studied, the EBV genome was not detected in healthy tissue. The diagnosis of invasive breast carcinoma were made by use of the criteria described by Contesso. Let us show this data in the following 2-2-table.

<b>Epstein-Barr virus and breast cancer.</b>				
		Human breast cancer		
		Yes	No	
Epstein-Barr virus infection of human breast	Yes	51	3	54
	No	49	27	76
		100	30	130

### 2.1 Statistical Analysis

All statistical analyses were performed by self-programmed software. The new statistical techniques developed by Barukčić (Barukčić 1989, 2006a, 2006b; Thompson 2006) were used. The formula of the *conditio per quam* was used to detect a **conditio per quam relationship** like **when A then B** between investigated random variables.

The mathematical formula of the **causal relationship c** (Barukčić 1989, 2006a, 2006b; Thompson 2006) discovers causal relationships between experimental/non-experimental data. This formula was used to proof whether there is a significant causal relationship between Epstein-Barr virus and human breast carcinoma. All P values are one-sided; significance was indicated by a P value of less than 0.05.

### 3. Results

#### 3.1. **When** infection of human breast with Epstein-Barr virus **then** development of human invasive breast carcinoma.

According to the study above, 3 out of 54 EBV-infected patients did not develop breast cancer, could there be still a relationship? Let us reanalyse the data Bonnet et al. (Bonnet 1999) . Our hypothesis are:

Ho: Null-Hypothesis:  $p(\text{Epstein-Barr virus infection human breast} \rightarrow \text{Human breast cancer}) = 1$ .

HA: Alternative-Hypothesis:  $p(\text{Epstein-Barr virus infection human breast} \rightarrow \text{Human breast cancer}) < 1$ .

##### 3.1.1 The probability of the conditio per quam relationship

The probability of the when infection of human breast with Epstein-Barr virus then development of human invasive breast cancer can be calculated from the data above (Barukčić 2006a, pp. 282-284) as

$$p(\text{Epstein-Barr virus infection human breast} \rightarrow \text{Human breast cancer}) = 0,9769230.$$

##### 3.1.2 The lower confidence bound of the conditio per quam relationship

The lower confidence bound of the conditio per quam relationship above was calculated from the data above (Barukčić 2006a, pp. 283-284) as

$$p_{\text{lower}} = 0,9278684.$$

The probability of the conditio per quam relationship

$$p(\text{Epstein-Barr virus infection human breast} \rightarrow \text{Human breast cancer}) = 0,9769230$$

is higher then

$$p_{\text{lower}} = 0,9278684.$$

In so far, the data above do support our Null-hypothesis:

**when** infection of human breast with Epstein-Barr virus  
**then** development of human invasive breast cancer,

we accept the Null-hypothesis and reject the Alternative-hypothesis ( $p < 0.05$ ).

**When**  
infection of human breast with Epstein-Barr virus  
**then**  
development of human invasive breast cancer.

### 3.2 Epstein-Barr virus: a cause of human invasive breast cancer

The infection of human breast with Epstein-Barr virus could be a cause of human breast cancer too. Let us reanalyse the data Bonnet et al. (Bonnet 1999) with the help of the mathematical formula of the **causal relationship c** ( Barukčić 2006a) under this point of view. Our hypothesis are:

Ho: Null-Hypothesis: **c ( Epstein-Barr virus  $\Rightarrow$  Breast cancer )  $\leq$  0.**  
or there is no causal relationship between Epstein-Barr virus and breast cancer.

HA: Alternative-Hypothesis: **c ( Epstein-Barr virus  $\Rightarrow$  Breast cancer )  $>$  0.**  
or there is a causal relationship between Epstein-Barr virus and breast cancer.

#### 3.2.1 The calculated causal relationship **c** <sub>calculated</sub>

The **causal relationship c** between an infection of human breast with Epstein-Barr virus and the development of breast cancer was calculated according to Barukčić ( Barukčić 2006a, p. 331 ) as

$$\mathbf{c = + 0,350542603629094.}$$

#### 3.2.2 The critical value of the causal relationship **c** <sub>critical</sub>

The critical value of the **causal relationship c** <sub>critical</sub> was calculated according to Barukčić ( Barukčić 2006a, p. 331 ) as

$$\mathbf{c = + 0,144263206677778.}$$

#### 3.2.3 The P value of the causal relationship **c**

The P value of the causal relationship **c** above was calculated according to Barukčić ( Barukčić 2006a , pp. 331 ) as

$$\mathbf{P\ value = 0,0000321021661870979.}$$

#### 3.2.3 The Power of the causal relationship **c**

The power of the causal relationship **c** above was calculated according to Barukčić ( Barukčić 2006a, p. 332-335 ) as

$$Z_B = - 2,351946991081612393756275217239.$$

$$\mathbf{power = 1 - p ( Z_B = -2,351946991081612393756275217239 ) = + 0,990662281953314,}$$

a very strong and highly significant result. Thus, we reject our Null-Hypothesis and accept the alternative hypothesis.

There is a highly significant causal relationship between an infection of human breast with Epstein-Barr virus and the development of human invasive breast cancer ( P value = 0,0000321021661870979, Power = 0,990662281953314 ).

**Epstein-Barr virus is a cause of human breast cancer.**



#### 4. Discussion

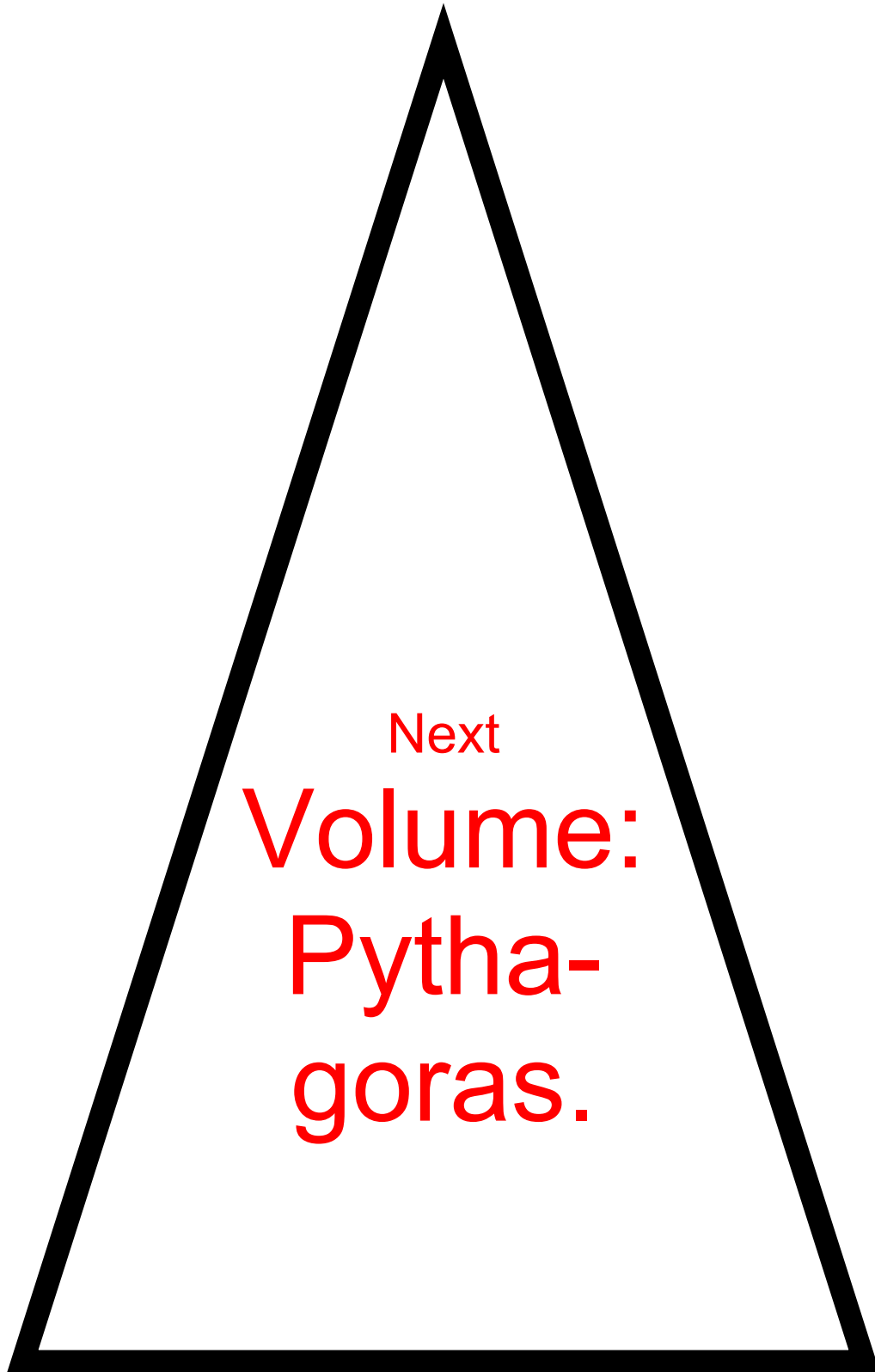
The result above is highly significant and thus very important. **When infection of human breast with Epstein-Barr virus then development of human invasive breast cancer.** An infection with Epstein-Barr virus is thus a *conditio per quam* of human breast cancer. But at the same time, Epstein-Barr virus is a cause of human invasive breast cancer ( p value = 0,0000321021661870979, power = 0,990662281953314). Not all, but just about  $100 \cdot (51/100) = 51$  percent of human breast cancer are caused by Epstein-Barr virus. Finally, **a main cause of human invasive breast cancer is identified.** A vaccine against Epstein-Barr virus will prevent from breast cancer.

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